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Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

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[OFFICIAL NOTICE.]

Change of Meeting Date, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF SECRETARY, NEW ALBANY, IND.,
February 23, 1904.

To the Members of the Western Gas Association: By an almost unanimous vote of the members of the Western Gas Association, the date of the meeting has been changed, from the third Wednesday in May to June 14, 15, 16 and 17. Yours truly, J. W. DUNBAR, Secy.

[OFFICIAL NOTICE.]

Twentieth Annual Meeting, Ohio Gas Light Association.

OHIO GAS LIGHT ASSOCIATION,
OFFICE OF THE SECRETARY, DELAWARE, O.,
February 25, 1904.

The Twentieth Annual Meeting of the Ohio Gas Light Association will be held at Cleveland, O., March 16th, 17th and 18th.

The President, Mr. John D. McIlhenny, of Philadelphia, Pa., will call the meeting to order on Wednesday, March 16th at 9:30 A.M., in Assembly Hall at the Hollenden Hotel, the headquarters.

The following will be presented at the meeting:

"Question-Box," edited by Mr. Henry L. Doherty, New York City.

"Progress Department," edited by Mr. Irvin Butterworth, Detroit, Mich.

"Novelty Advertising Department," edited by Mr. B. W. Perkins, South Bend, Ind.

"Wrinkle Department," edited by Mr. E. E. Eysenbach, St. Paul, Minn.

Reports of Committees:

"Uniformity of Gas Meters," Messrs. Chas. S. Ritter, Detroit, Mich.; R. Shacklette, Adrian, Mich.; Donald McDonald, Albany, N. Y.

"Standard Sizes for Coke," Mr. C. W. Andrews, Duluth, Minn.

"Uniform System of Mapping Mains," Mr. W. H. Barthold, Grand Rapids, Mich.

"Standard Methods of Testing Fuel Gas Appliances," Messrs. Henry L. Doherty, New York City; F. W. Stone, Ashtabula, O.; John Franklin, Cincinnati, O.

"Flow of Gas in Pipes," Messrs. H. A. Carpenter, Pittsburg, Pa.; J. D. Shattuck, Darby, Pa.; J. O. Johnston, Columbus, O.

"Bureau of Forms and Records," Mr. F. W. Stone, Ashtabula, O.

Papers:

"The Construction and Operation of Recuperative Benches; No. 2," by Mr. W. A. Baehr, St. Louis, Mo.

"Why English Gas Outputs are Large, with Lessons to be Drawn in the United States," by Mr. J. T. Westcott, London, Eng.

"Economy in Oxide Purification," by Mr. H. L. Rice, Norfolk, Va.

"High Pressure Gas Street Lamps," by Mr. J. J. Knight, Kalamazoo, Mich.

"Care of Station Meters," by Mr. Henry R. Cartwright, Philadelphia, Pa.

Short Topics:

"District Collection of Gas Bills," by Mr. F. W. Frueauff, Denver, Col.

"Burning Coke Breeze on Hollow Grates," by Mr. C. H. Williams, Madison, Wis.

"Burning Coke Breeze with Under-Feed Stokers," by Mr. M. E. Malone, Denver, Col.

"Water Gas Tar Used in Generators for Enrichment," by Mr. Henry I. Lea, Fort Wayne, Ind.

"Industrial Fuel Gas Appliances," by Mr. J. Chas. Andrews, Denver, Col.

Competitive Papers:

"Best Arrangement for Recovering and Utilizing the Waste Heat from Gas Benches." Premium offered by the President, Mr. John D. McIlhenny.

An opportunity will be given any of the speakers at the meeting to correct their remarks before leaving Cleveland, but not after, as all the reports will be turned over to the printer immediately after the meeting.

The Hollenden is conducted on the European plan, and the following rates have been secured for the meeting: $1.50, $2, $2.50, $3, $3.50, $4

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per day for each person, each room to be occupied by two people or paid for accordingly.

The Hollenden hopes to entertain all of the Association and will put forth every effort to make the members comfortable. The most satisfactory quarters are always obtained by writing in advance to the hotel people.

Through the courtesy of the lines constituting the Central, Trunk Line, Southeastern and Western Passenger Associations and the Southwestern Excursion Bureau, persons attending the meeting will be granted special rates for transportation under the certificate plan, viz., full fare going and one-third fare returning.

The territory covered by these Associations includes all States East of the Missouri and Mississippi rivers, except the New England States; and Nebraska, Kansas, Colorado and Missouri, west of the Missouri river. Each person desiring the excursion fare must purchase a first-class ticket to the place of meeting, for which he will pay the regular fare, and upon request the ticket agent will issue a printed certificate of purchase. Tickets for the return journey will be sold by the ticket agent at the place of meeting at one-third the first-class fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, countersigned by the Secretary of the Association, vised by the special agent of the Passenger Associations. Apply for ticket and certificate at least 30 minutes before train time. Be sure to hand the Secretary your certificate, ascompanied by 25 cents, as soon as you reach headquarters. All persons attending the meeting, whether members or not, are entitled to the reduced rates. It was only through the most strenuous efforts that the above concession was secured from the Passenger Associations, and *you are most earnestly requested to obtain a railroad certificate when buying your ticket for Cleveland.*

The Secretary will furnish with pleasure application blanks for membership and any further information which may be desired relative to the meeting.

T. C. Jones, Secretary.

[Notice.]

The American Gas Light Association and the Proposed Gas Congress.

The following notice, issued by Mr. C. J. R. Humphreys, Chairman of the Gas Congress Committee of the American Gas Light Association, inviting other Gas Associations to assist in the preliminaries and to share in the deliberations of the Congress, explains itself:

New York, February 17th, 1904.

The American Gas Light Association cordially invites the * * * Gas Association to participate in a Gas Congress, to be held at St. Louis, June 15th, 16th and 17th, a time when it is thought the Louisiana Purchase Exposition will be at its most interesting stage.

Never before in the history of the gas industry has an effort been made to hold a Congress of all the Gas Associations of America, and it is felt by the Committee of the American Gas Light Association having the matter in charge, that the Louisiana Puschase Exposition offers a most excellent opportunity for the Gas Associations thus to meet together, that the gas men from the North, the South, the East and the West may discuss subjects of mutual interest, each contributing from his information and experience to the common storehouse of knowledge, and each in his turn enriched by drawing upon that same fund of information, made up by the experience of men living thousands of miles apart, but all interested in a common cause. Add to this thought the attractions offered by the Exposition, and surely the occasion would seem auspicious for the first Gas Congress of the Gas Associations of America.

There are scattered throughout this country 11 Gas Associations with a membership of about 2,000, and it is confidently thought that if these Associations join with the American Gas Light Association in such a gathering it could not but be a pleasurable occasion, it could not but be a profitable occasion, and it could not but redound to the advantage of those pecuniarily interested in the gas industry.

The nucleus of a good attendance is assured by the fact that the Western Gas Association has arranged to hold its annual meeting on the day before the opening of the Congress, to have only a 1-day session, and then adjourn to meet with the Congress.

It is intended that the appropriate officers of the participating Associations should be vice-presidents of the Congress. It is intended to invite gas engineers from abroad to participate in the Congress.

As the time for the preparation of the various details of the Congress is short, we would urge you to appoint a committee with power to act in this matter. Yours very truly, C. J. R. Humphreys,

Chairman Gas Congress Committee.

BRIEFLY TOLD.

The End of the New England Meeting.—Our despatches respecting the completion of the thirty-fourth annual meeting of the New England Association of Gas Engineers last week were delayed beyond our press time. However, the account given brought the proceedings up to the close of the banquet, Thursday night, the 18th inst. The final session was called to order the morning of the 19th by President McKay, and whether the snow that was falling outside had anything to do with keeping the members inside, the fact is that an excellent attendance greeted the Chairman's call. Belated applications for membership (four in number) were favorably acted upon, after which the joint paper, by Messrs. A. J. Campbell and Geo. B. Leland, of Norwich, Conn., on "Testing Water Heaters," was read by Mr. Campbell. A good discussion followed its reading, after which came the reports from the Committees on Obituaries, the one read by Mr. A. B. Slater, Jr., respecting Henry B. Leach, being noteworthy. The Question Box was then cleaned up, and its disposal was the sequel for the paper, by Mr. H. W. True, of Boston, Mass., on "The Gas Engine from the Manager's Standpoint." This paper brought out a brisk discussion, in the rendering of which it would seem that many gas managers are not in favor of the methods pursued by builders and sellers of gas engines. The usual votes of thanks having been passed, President McKay declared the meeting adjourned. The convention was fully up to the New England's high standard.

Third Annual Meeting of the Wisconsin Gas Association.—Advices respecting the third annual meeting of the Wisconsin Gas Association, which was held in the Hotel Pfister, Milwaukee, Wis., the 17th and 18th insts., are rather meager. The attendance was about 50, the weather was clear and cold, and the sessions interesting. Besides President Hyde's inaugural address the following papers were read: "Maintenance of Incandescent Gas Burners," by Mr. Ewald Haase, of Milwaukee; "Points in the Design of a Coal Gas Works," by Mr. A. G. Lloyd, of Detroit; and "A Brief Outline of Gas Works' Chemistry," by Mr. H. B. Harropp, of Milwaukee. The officers elected were: President, Mr. E. G. Pratt, of Milwaukee; Vice-President, Mr. B. F. Vilas, Chippewa Falls; Secretary-Treasurer, H. H. Hyde, Racine. Fourteen new members were added to the rolls, and Milwaukee was chosen as the next meeting place. There was no particular form of entertainment although many of the members visited the Alhambra Theater the evening of the first day, and a part of the afternoon of the second was profitably and pleasurably taken up by a visit of inspection to the magnificent new Menomenee Valley plant of the Milwaukee Company.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

Glad That We Were Wrong.

The United Electric Light and Power Company,
Office General Manager, 30 South Eutaw street,
Baltimore, Md., Feb. 17th, 1904.

To the Editors American Gas Light Journal: The well known conservatism of your paper and the safeness of its opinions have been, I think, violated by the statement in the news items, under the heading "Briefly Told," in your issue of the 15th inst. The properties of the United Electric Light and Power Company were not blotted out, and there was no confusion whatever in the way of public and private lighting from the stations of this Company.

The Penn street, the Center street and the Monument street stations of this Company were absolutely uninjured by the fire, and the fireproof McClellan street station, within three days of being placed in commission for supplying the new underground distributing system, proved to be absolutely fireproof, and acted as a barrier, protecting fully 20 buildings, which otherwise would probably have been destroyed. The only damage to the building was through the falling of the walls of buildings opposite. That it was seriously threatened is shown by the fact that it is surrounded by razed buildings, and one can look from the windows a distance of many blocks across acres of bricks and debris. We expected to have this station in operation about the 1st of March.

Furthermore, while I cannot speak officially in connection with it, yet it is a fact that the new Pratt street power house of the Railways Company was uninjured and is absolutely the only building in the burned district now in operating condition. That these buildings stood so well under the trying ordeal is due to the foresight and engineering skill of the Consulting Engineer, Mr. P. O. Keilholtz.

The only interruption to lighting service in Baltimore occurred from the time that it was found possible to discontinue service within the burned district; namely, about noon of the day when the fire started at about 11 A.M. The service was resumed within a few minuses, say, a quarter of an hour after dusk of the same evening, in all sections of the city outside of the burned district, with one minor exception.

Owing to the extent to which your paper is read among central station people and gas managers, may I ask that you make the necessary correction of the statements of the issue of the 15th inst.? Yours truly,

Douglass Burnett, General Manager.

[Official Report—Revised by the Secretary.]

THIRTY-FOURTH ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held in Young's Hotel, Boston, Mass., Feb. 18th and 19th, 1904.

First Day, Feb. 18—Morning Session.

The President, Mr. William E. McKay, called the meeting to order at 10:40 A.M., Thursday, February 18.

On motion of Mr. Allyn, the reading of the minutes of the last meeting was dispensed with, the same having been published in the American Gas Light Journal.

The President called for the

Report of the Board of Directors,

which was read by the Secretary as follows:

Boston, Mass., Feb. 17, 1904.

To the Members of the New England Association of Gas Engineers:

Your Directors would report that they have examined the following applications for membership, and recommend their election to the various classes, in some cases to be subject to the payment of admission fees.

Active.

Butterworth, C. W., St. Albans, Vt.	Norcross, J. A., New Haven, Conn.
Church, J. F., Willimantic, Conn.	Slade, R. E., Hartford, Conn.
Gould, V. K., Bangor, Me.	Smith, C. E., Torrington, Conn.
Johns, L. B., Hyde Park, Mass.	Witherby, E. E., New York City.
Luther, W. J., Attleboro, Mass.	

Associate.

Blanchard, G. L., Montpelier, Vt.	McQueston, Lawrence, Mass.
Brown, A. M., Boston, Mass.	Osborne, R., Boston, Mass.
Burr, New Haven, Conn.	Potter, P. J., Boston, Mass.
Fuessenich, F.F., Torrington, Conn.	Richards, J. L., Boston, Mass.
Garcia, E., Boston, Mass.	True, H. W., Allston, Mass.
Jefferson, S. O., Boston, Mass.	Warren, W., Boston, Mass.
Mack, C. A., Boston, Mass.	Wood, G. B., Boston, Mass.

Transfer from Associate to Active.

Cheney, H. N., Allston, Mass.

Resignations.

Calvin, A. Dart, E. Magee, J. Tarbell, A. W.

We also recommend the name of Mr. William H. Bradley, Chief Engineer of the Consolidated Gas Company, of New York city, for election to Honorary Membership.

We have also examined and present for your consideration the following papers:

"Inclines as Used at Lynn," by Mr. C. F. Prichard.
"Inclines at New Bedford, Mass.," by Mr. C. H. Gifford.
"Testing Water Heaters," by Messrs. A. J. Campbell and G. B. Leland.
"Installation and Maintenance of Gas Arcs," by Mr. T. H. Hintze.
"The Gas Engine from the Manager's Standpoint," by Mr. H. W. True.

N. W. Gifford, Sec.

On motion of Capt. White, the report was received and filed. The recommendations therein were ordered acted on.

Election of New Members.

The President, having noted that, on motion of Mr. Addicks, the applications for active and associate membership, and for transfer from associate to active, should be the subject of ballot as cast by the Secretary, appointed Messrs. Addicks and Coffin to receive the vote. In due time the tellers reported the result, and the President declared the gentlemen named elected.

Mr. W. H. Bradley Elected to Honorary Membership.

The President—There remains the recommendation of the Board that Mr. William H. Bradley, of New York, be elected to Honorary Membership.

Mr. J. J. Humphreys, Jr.—I move that the recommendation of the Board, that Mr. William H. Bradley be elected an honorary member of the New England Gas Association, be adopted.

Mr. Addicks—I have the honor of seconding, although perhaps it does not need a second for honorary membership. I want to say, of course, that the New England Association honors itself by honoring Mr. Bradley in this way. You all know him very well. He has been amongst us a great many years, but only those who have been intimately associated with him fully appreciate his work. (Applause.)

The motion was adopted and the result as announced was received with cheers.

The President—Mr. Bradley, it gives me great pleasure to be Recording Clerk in placing your name on the honorary roll of the Association.

Mr. Bradley—Mr. President and Gentlemen: I thank you all heartily for this mark of your confidence and esteem, and assure you it is totally unexpected. I had no intimation as to this action of your Association; but I am very glad to think that I am so known and appreciated by such a body as this. (Applause.)

Committee on Nomination of Officers.

On motion of Mr. Addicks the President appointed a committee on nomination of officers, the appointees being Messrs. S. J. Fowler, W. R. Addicks and W. A. Learned. The President also said: I hope that all the new members who are with us and have just been elected to membership will actively participate in all the work of the Association at this meeting, and not wait for some other meeting. Begin now by discussing everything that you can either successfully criticize and assail, or that you can support, but don't keep quiet.

Vice-President Richardson assumed the Chair, and the President read the following

INAUGURAL ADDRESS.

A survey of the gas business for 1903 exhibits satisfactory development in all directions. The exceptional education in the use of gas, consequent upon the shortage of anthracite fuel last winter, conferred an enduring benefit upon our industry. The remarkable increase then induced in the sales of gas has been in general well maintained. The relative position of New England prior to the coal strike has been indicated by the report of the United States Geological Survey for 1902, showing that Massachusetts was then second only to New York in the quantity of gas sold, and was first on the list of States in sales of and revenue from coke, tar and ammonia produced at gas works. This growth is sufficient evidence of vitality, and it has brought forward many new problems for solution. The requirements of new construction have engaged more than the usual share of our attention, and new details of manufacture give fresh interest to this annual meeting for exchange of experience. Contemporary education takes nothing for granted, and as the people who do things are the people who know things, an insatiable appetite for facts is making an incessant demand upon contributors of papers or discussions; but, even with standard systems of computation and estimate, only a personal attendance at our meetings permits an adequate comprehension of the personal equation, and a fairly just judgment of the comparative value of new plants and new processes. Our attitude has little changed in the 300 years since the Elizabethan philosopher said, "All innovations are at first ill-shapen, and while it is true that what is settled by custom is at least fit, new things piece not so well, and are, like strangers, more admired and less favored."

The enormous growth of our business enhances and emphasizes the value of the sense of proportion, of subordinating the less important to the more important details. The necessity of knowing what not to do equals in importance other demands made upon an engineer. We began with hand made coal gas, and the transition was through water gas machines to machine made coal gas; but the principal factor is still the man, whether he is before the retort or behind the machine. Though accelerating production and displacing some labor, installations of machinery are not inevitably economical, especially when the operation and maintenance require the supply of more intelligent labor at a higher wage. While a superior mechanic can make nearly any accepted appliance operate successfully, an inferior workman can bring condemnation upon well contrived mechanism. As a nation we are impatient to substitute mechanical work for manual labor, and it is our fortune to grow so rapidly that occasions are infrequent when the business returns do not justify the mechanical engineering construction.

Our large use of steel and cement impels a reference to the experimental structure on "Soldiers' Field," in Cambridge, Mass., where $300,000 has been expended for erecting the Stadium of concrete—an experiment that will effectually demonstrate the enduring qualities of this material under the extreme conditions of a severe climate. The expected success of this undertaking should greatly extend the use of concrete, especially in that class of investment that is perpetual, for the advocates of the use of good concrete omit depreciation from their schedule.

The full account of the annual meetings of other gas associations (local, national and foreign), with their ample reports of progress, relieve me of the necessity of a present review of the business in detail, but it is to be noted that our rivals and fellow tradesmen, purveyors of electricity, have awakened from their futile dream of supremacy, and they are now engaged in demonstrating to each other the excellence of incandescent gas lighting; they have also effectively advertised the merits of gas for power. According to Census Bulletin No. 5, June, 1902, 165 gas engines, with a total of 12,181-horse power, were being used to generate electricity for lighting; and 15 gas engines, 1,925-horse

power, were in use by street and electric railways. The careful study of the gas engine has been prominent in the proceedings of the Mechanical Engineers, and there is a daily multiplication of testimony proving from working results that, for many purposes and in many sizes, the gas engine is the most economical motive power obtainable. The magnitude of the field may be deduced from the report that, exclusive of power for traction and lighting, there is now available in the United States for manufacturing purposes 12,000,000-horse power; 75 per cent. of this is from steam engines, 15 per cent. is water power, and 10 per cent. is from miscellaneous sources. For the electric light companies of Massachusetts, in 1902, the distribution of energy income was as follows: Commercial lighting, 57 per cent.; street lighting, 27 per cent.; motors, 16 per cent.

In 1904, 22,000 new gasoline automobiles will strenuously advertise the admitted economy and the compact efficiency of the internal combustion engine. Such diligent advertising, together with persistent soliciting, and with helpful advice upon request, have a reward in gratifying sales of gas. The trend of affairs is illustrated by the number of permits issued for gas engines in Boston: 1896, 1; 1897, 2; 1898, 9; 1899, 22; 1900, 35; 1901, 34; 1902, 80; 1903, 80. When it is considered that a million cubic feet of gas per annum can be used by every 20-horse power gas engine in operation, we can estimate the increase in output that would follow a more general adoption of the gas engine. An obstacle to such installations must be recognized in the occasional ignorance of consumers, resulting in unsatisfactory selection of engine or in improper or careless use; to obviate this difficulty the gas office can be a bureau of information, dispensing counsel and assistance serviceable to all consumers of gas.

The average American does not want to be bothered with the minute care of the articles that are sold for use with gas. If gas appliances are to do their best work they must be in the care of those who would make it a business to keep them in good condition. The extravagance of the early promotion of electric lighting educated the consumer in some of the possibilities of illumination, and now that gas is displacing electricity, our patrons expect continued freedom from care, and they unwillingly endure broken mantles and cracked chimneys rather than be distracted by interruption for renewal or adjustment of burners. A moderate annual or monthly charge for the maintenance of a 4-burner gas arc is usually satisfactory for both parties to such agreements, and some consideration of this system is compelled by the wide and increasing favor accorded gas arcs, both for indoor and for outdoor lighting. In the United States, in 1902, the average income (irrespective of the hours of burning) from each of 400,000 electric arc lights was $65.33, and from each of 19,000,000 16-candle power incandescent electric lamps the average income was $2.52. These figures are certainly an invitation to gas companies to behold the promised land, and to enter in and possess it, unless electrical engineers can devise new forms of lamps that will give more and better light while using less current.

The condition of street mains liable to electrolysis continues to cause grave concern. In Cambridge, near a power house, a 48-inch water main, that had been badly pitted and grooved, was coated with alternate layers of asphaltum and burlap, making a covering ¼ inch to ½ inch thick, with the reported effect, while perfect, of retarding electrolytic action of the pipes thus coated, but tending to increase damage to adjoining pipes not covered. As all iron construction can serve as current conductor, there are now complaints that bridges and other structures of like magnitude are being seriously damaged. I think no one will differ from Mr. Maury's conclusions, stated in his paper on "Surveys for Electrolysis," at the 1903 meeting of the American Water Works' Association, that there is no known method by which owners of gas and water pipes can themselves prevent injury from single trolley currents; when there is a change to the double trolley the injury ceases.

In all stages of construction and operation, a prerequisite of efficient engineering is the ability to measure correctly everything—length, surface, volume, mass, temperature, light or power. Technical education is furthering the rapid progress of our profession by giving us graduates who have been trained to measure accurately cause and effect—the certificated knowledge of these young men, supplemented by business experience, makes them very welcome and very valuable; and we base a hope for serviceable invention upon their industrious observation and upon their fertile and active imagination. The one process that may be expected to tax their persevering patience most frequently is that of explaining to customers how and why the gas meter measures volume with admirable accuracy. This particular item of complaint is only one of many that perpetually harass gas managers. The importance of tact in dealing with complaining consumers has become a favored topic at meetings of gas and electrical engineers. If tact were merely doing or saying the right thing at the right time, such a meaning would be a definition of success in general; but when patience and politeness are the external manifestations of a bona fide kindness and interest, then the commercial value of courtesy must be highly extolled.

From the nature of our profession a knowledge of what is done in cities other than our own is necessary to enable us to provide well for present operation and for future requirements. Travel and correspondence help us to keep abreast of the times, and we owe a great deal to the GAS LIGHT JOURNALS which give us promptly full reports of Association proceedings, and other technical and practical information. Noteworthy contributions, in 1903, to the English journals were the articles and drawings on the new Edinburgh works, by Mr. R. W. Herring, and the remarkable and model paper, by Mr. A. C. Hovey, on "Constructional Details and Costs at Tynemouth." Our Secretary has issued one Volume of the Proceedings of the last two annual meetings, and a second volume that will include the proceedings of three years—1897, 1898 and 1899—is now in print. With the issue of this last the Association will have three volumes containing the complete proceedings for the seven most recent years. An Association headquarters and the Library have been established at 715 Tremont Temple, Boston; and the Secretary has arranged for the issue of books to members when they cannot conveniently call for them at the library. There exists in this beginning the nucleus of a project that can be made a helpful auxiliary to our professional work at all times, and that can be utilized as an attractive convenience to members whenever they are in Boston.

Many years have elapsed since the first meeting, and the membership shows great changes; more than two-thirds of the present members have joined the Association since 1890. Five members have died during the past year:

Eugene Vanderpool, July 12, 1903.
Henry B. Leach, July 25, 1903.
William A. Stedman, Nov. 8, 1903.
W. R. Plunkett, Dec. 7, 1903.
Howard M. Lane, Feb. 8, 1904.

These were members whose character was indicated by their purpose, and was sustained and illustrated by their ability and achievements. We deeply mourn their loss, and hold their friendship in affectionate remembrance.

With growth in age and in magnitude, permanent undertakings are disposed to consider the plans for the care of infirm and retired employees, that have been successfully adopted by many corporations. The British civil service scale of superannuation, which is applied to gas and water works' officials, apportions to the pensioner an allowance calculated at 1-60th of his retiring salary for each year of service, subject to a maximum of 40-60ths. The Pennsylvania Railroad Company retires its employees at 65 years (with exceptions in the cases of highly skilled specialists who are not incapacitated), on the basis, "For each year of service 1 per centum of the average monthly pay for the 10 years preceding retirement." At Harvard University the retiring allowance is 20-60ths of the annual salary, with an additional allowance of 1-60th for each year of service in addition to 20, and with a maximum allowance of 40-60ths; but "The obligation to pay retiring allowances will be neither greater nor less than the obligation to pay salaries, so that if misfortune shall compel a percentage reduction of salaries, retiring allowances will be reduced in the same proportion." Gas companies have characteristics that parallel to some extent those of railroad corporations and those of institutions of learning, for the works are fixed in location and continuous in operation, while every gas office is an active educational center. In these days, when affairs are conducted on a large scale, successful administration and commercial supremacy require in employees sobriety, fidelity, loyalty and zeal. There is thoughtful significance in the opening sentence of John Mitchell's book: "The average wage earner has made up his mind that he must remain a wage earner." Permanence of occupation is a powerful inducement to men of high character and ability, and superior service is attracted by a provision for superannuation. Continuity of employment, allowing a permanent habitation, and the ever active selective process, assure an elevation in the morale of employees that benefits also the corporation. Every engineer provides for depreciation, knowing that works will wear out and grow old; but workmen, too, will wear out and grow old, and there is for them a high beacon of encouragement in the plan that provides a retiring fund allotted on the basis of length of service and average wages earned.

The duties of engineers are constantly widening; not only constructive service, but more and more, administrative work is calling for the technically trained engineer. Everywhere it is emphatically asserted

and conceded that the ideal engineer is a scientific man and a business man. This Association is one of many that assist in the coveted post-graduate instruction, and our members—those writers who contribute generously of their time and talents for our information—are conscious of our appreciation, indorsing the sentiment of Princeton's President that "No task rightly done is truly private; it is part of the world's work." "Every man," wrote Bacon, "Owes a debt to his profession, and it is his duty to magnify his position and to ennoble the profession by elevating its standard." Such a purpose has always been conspicuously evident in the New England Association, and we hope and believe that ii will continue always, binding together the members, both old and new, not only by affiliation of intetests but also by the closer ties of friendship and esteem.

When President McKay had finished reading his address, which was heartily applauded several times, the message on motion was referred to a committee of three for consideration and report. The Committee comprised Messrs. C. F. Prichard, H. A. Allyn and F. H. Shelton.

(To be Continued.)

The Laying of High and Low Pressure (River) Gas Lines.

[A paper read by MR. H. C. MORRIS, of Bay City, Mich., at the Eleventh Annual Meeting of the Michigan Gas Association.]

In 1901, after the consolidation of the gas companies of East and West Saginaw, it was found that the cost of operation could be greatly reduced by the abandonment of one plant and the enlargement of the other, so as to have one plant of sufficient capacity to take care of the demands of both the east and west sides of the city. In view of the fact that the plant in West Saginaw was of old construction, lacking in proper facilities for saving residuals—tar, ammonia, etc.—and only of capacity sufficient to supply the demands made upon it at the time, it was decided, therefore, that the west side plant should be abandoned, and the consumers in that section of the city supplied by the east side plant, which was of more modern construction and of greater capacity.

Since the two sides of the city are separated by a river, in order to supply the west side consumers from the gas works on the east side, a line to be laid on the bed of the river, or a line across one of the numerous bridges was considered. The latter was feasible, but not practical for several reasons.

1. It would have been necessary to maintain a gasholder on the west side in order to have a constant pressure, all of the bridges being swing bridges and liable to be opened at any time.
2. It would have been necessary to have men stationed on the bridge selected 24 hours a day during the navigation season to open and close valves on bridge proper, also on the bridge swing.
3. It would also have been necessary to use specially adapted sleeves on a bridge line at each end of the swing, which necessarily would have to be connected and disconnected every time the bridge was swung.

So the more practical alternative was adopted; *i. e.*, laying a 12-inch, low pressure line on the river bottom. This was more expensive at first cost than a bridge line, but ultimately it would cost less to operate and maintain. The pipe decided upon was standard, 12-inch line pipe, with threads and couplings.

The width of the river at the point chosen for laying the line is 1,500 feet. About 200 feet of this is a bayou, approximately 14 feet deep, with a middle ground or island about 125 feet in width, and about 2 feet above the city datum line or normal level of the river. The balance of the distance is a ship channel varying in depth from 8 to 14 feet There was sheet piling along either shore, and it was necessary to have these piles pulled before commencing work.

The general scheme in the first attempt to lay a line was to make up the lengths of pipe on the middle ground, and after plugging the end of the length first entering the water float it across the river. The floating of the line was possible, since the plugged pipe, when floating, had an excess buoyancy of approximately 8.16 pounds to a foot over its sinking weight.

The line being a low pressure one, it necessarily had to be laid with a fall in order to take care of condensation or whatever water might leak into it. Therefore, considerable dredging had to be done, not only to get a proper fall, but also to get the line deep enough in the ship channel to conform with any possible change in depth in the channel that might be made necessary by future navigation. This depth was made 16 feet, which was approved by the United States Government.

The first attempt to lay the line was made in October, 1901, and the work at that time was under the supervision of a mechanical and civil engineer employed for the purpose. The attempt was a failure and the loss of money great. This failure can be accounted for by the fact that no strengthening sleeves of any kind were used over the pipe couplings, and no systematic soundings of the river bottom taken after the dredging had been done; and no method adopted to keep the pipe in the channel dredged for it when the pipe was being lowered into place, other than pieces of 4 by 4 timber in lieu of piles, driven for this purpose at intervals from shore to shore. These timbers were too light for the work required, with the result that, when the whole line was lowered, a strain was placed upon the pipe at the couplings, and a greater strain upon certain couplings which were in that part of the line afterward found to be out of the proper channel.

Odd lengths of railroad iron and large pieces of limestone saddled together with pieces of wire were used as weights to sink the pipe; and as there was nothing to hold the pipe to the surface of the water until these weights or ballasts had been evenly distributed along its entire length, the pipe went down very unevenly. This in itself did very much toward straining the pipe at the point where the threads entered the couplings.

After the pipe had been lowered in the manner above stated, the engineer had the line filled with water, as he said, "To settle same." This was all very well until the time came to pump out the water, which it was found impossible to do. The next thing to be done, of course, was to try to locate the leak or the reason why it was not possible to empty the water from the line. This was done by a compressed air connection at the shore end of the line. By this method it was shown that the line was leaking in four or five different places. Marine divers were then secured and their examination demonstrated that it would be impossible to repair the breaks with river sleeves, and that it would be necessary to take up the line—a hard luck story, but nevertheless true. The raising of the pipe was begun four or five lengths at a time, and the work made comparatively easy by means of a lighter, the pipe taken to shore and disconnected. This operation was continued until all of the pipe was again placed on shore.

The season was now well advanced to the end of November, with ice forming in the river, making it practically impossible to continue work. Operations were, therefore, abandoned for the time being, with the lesson well learned that experience is the greatest of all teachers. During the winter months that followed we had plenty of time to think over our expensive experience, and weigh well our intentions before again starting on the work. Of two things we were sure—no more so-called "expert engineers," and no pipe laid without strengthening sleeves around the couplings.

The following spring the 12-inch pipe that had been used in the previous attempt was taken to a machine shop and re-threaded, the threads having been damaged in the previous lowering of the line. New couplings were secured and protecting sleeves made to clamp over the pipe at each joint. These protecting sleeves were made similar to a split sleeve used for repairing ordinary gas mains, with the exception that a recess was made in the center of sleeve in order that the sleeve would clamp around the pipe and clear the coupling. The sleeves were made of ¾-inch cast iron, weighed approximately 300 pounds, and were cored for five ¾-inch bolts on either side; the length of sleeve was 22 inches.

The pipe and protecting sleeves were taken across the bayou to the middle ground, and as the pipe could all be made up at practically one point, a small boiler and hoisting engine were procured and set up on the middle ground to be used in screwing up the pipe. A compressed air pump was also placed on the middle ground and used to test the line as it was made up. A heavy pipe tong was made about 8 feet long by using a piece of oak and a piece of chain about 12 feet long. The chain was bolted into the oak stick about 8 inches from the end, and the tong was used by wrapping the chain around the pipe and running a rope from the end of tong to the drum of the hoisting engine. By the use of this apparatus the jerk and jar of screwing up the pipe, as with ordinary tongs, were avoided.

While the pipes, sleeves, tools and other materials were being collected on the middle ground, dredging was being done. Guides for the dredging had been made by driving numbered pieces of 4 by 4 timber, 50 feet apart at intervals across the river. The dredge engineer was furnished with a chart showing the depths wanted opposite these guides. The dredging was accomplished with fair results by graduating in feet and half feet the dipper arm on the dredge.

The dredge man was checked after every move ahead. The only error that was made in the dredging was in keeping the depth too near that required, instead of having it 1 foot or 1½ feet deeper, as will be shown hereafter. In the channel the dirt brought up by the dredge was taken away on dump scows. The cut made by the dredge was from 7 to 9 feet wide, this width being necessary to prevent the filling in again of the cut before the pipe could be lowered into it.

After the dredge had advanced far enough from the shore, a pile-

driver was started driving piles in pairs 12 feet apart, the distance between pairs averaging 60 or 70 feet. A bent was made by placing a piece of 6 by 6 timber across the piles held in position by drift bolts. The 60 or 70 feet between bents was ample space for all navigation.

By using protecting sleeves it was found that each foot of pipe weighed approximately 6.84 pounds more than the water displaced by it, therefore, cedar poles were rafted together near the middle ground for use in floating the pipe as it was made up. This was unnecessary the year before, as the pipe would float without any means other than keeping out the water. By way of explanation, it might be stated that about 10 men were used on this work, this number being required to handle pipe, etc., but on the last day, when the pipe was ready to be lowered, 22 or 23 men were used.

As soon as the first bent of piles had been driven, work was started making up the pipe, and the hoisting engine used to perfection in doing this work. As soon as several lengths of pipe were made up and the sleeves clamped over the couplings, the pipe was launched out. To avoid any possible danger from leakage, all pipe threads were thoroughly coated with black manganese and shellac, and the face of each coupling caulked with yarn and red lead before application of sleeve. Each section of pipe was lashed between two parallel cedar poles as it was launched out. This method was used until approximately 300 feet only of the river remained to be crossed. Of this 300 feet 200 feet was in an old log boom on the west shore, and 100 feet in the main ship channel which was in daily use.

It was found that it would be necessary to close the channel to navigation for at least one day, so in order to save time sections composed of 2 and 3 lengths of pipe were made up ready to screw into the line immediately after the closing of the channel. After these preparations had been made, notice was received that the channel could be conveniently closed to navigation on a certain day.

After the line had been made up in its entire length and was about ready to be lowered, a rain storm came up and the level of the river was raised at least 2 feet. This necessarily increased the current and considerable sand and silt consquently washed into the cut that had been dredged for the pipe. In fact, about 100 feet of the cut was in this way filled from 12 inches to 14 inches higher than the chart would permit if the line was to be laid with the intended fall or grade. The grade could not be varied in view of the fact that this was to be a low pressure river line, and would necessarily have to have a perfect fall from the middle ground to a drip at the west shore to take care of any condensation and leakage. And inasmuch as the channel was practically closed, and it was impossible to use the dredge with the pipe on the surface of the water, it was decided to lower the line to the bottom, which would open up the ship channel again and permit dredging to be done alongside of the line. This second cut was made by the dredge as close to the line as it was safe to work the dipper without striking the pipe. When the cut was of sufficient depth, the sand and silt under the pipe were washed into it by the current, thus allowing the line to settle to the depth desired.

The following method was used in lowering the line: As many measuring sticks as there were bents of piles were graduated into feet and quarter feet; two men were stationed at each bent of piles, one man to hold a measuring stick on the top of the pipe as it was being lowered, the other to lower when signals were given. One-inch rope was lashed to the 6 by 6 timber across the piles and then passed under the pipe, and 3 or 4 wraps taken around the 6 by 6. The cedar floats were then taken away, which left the pipe suspended in the rope sling ready for lowering, which was regulated by signals given by the superintendent in charge of the work. The pipe was lowered 6 inches at every signal. By watching the measuring stick at each bent of piles after a lowering signal had been given, it could be seen that the line was being lowered to the same depth at all points, and no uneven strain put on any particular length of pipe.

This operation was continued until the entire line was lowered to the depth required, when the ropes were lashed to the 6 by 6 and left this way until such time as filling could be dumped under the pipe where the dredging had been too deep. In this way it was possible to obtain a perfect fall. Nothing now remained to be done but to make land connections at the gas works, on the east shore, and with the west side trunk line on the west shore. A piece of 12-inch pipe was used for a drip-pot, and a common brass cylinder, deep well pump for the pump. (See details of shore connections for form of drip.) The line was completed in July, 1902, and since that time no trouble has been experienced from the water, as the drips make approximately 2 gallons of water only per day, and the drip-pot will hold about 50 gallons.

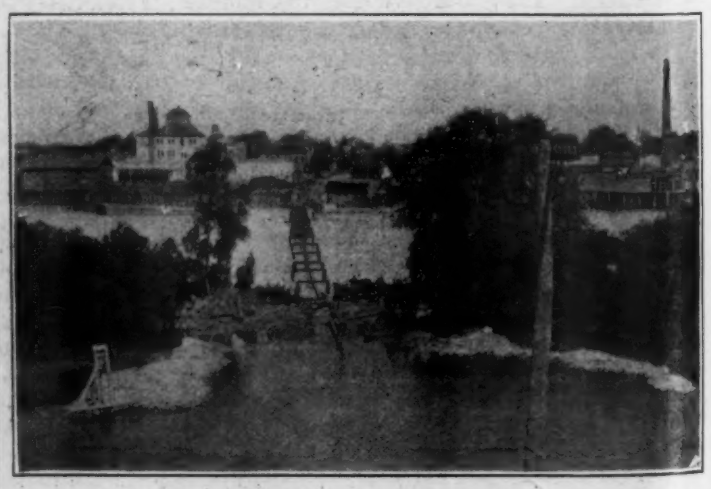
In 1903 it was decided that another river line was required as an emergency line, to be used only in case of accident or during repairs on the old line. A 4-inch, high pressure line was considered of ample capacity for the purpose. The point selected for the laying of this line was about 500 feet above the 12-inch line, a distance considered sufficiently safe to avoid any possible accident to the old line because of working on the new. Then it was deemed well to have the two lines so far apart that any accident happening to one might not affect the other. At this location a navigable cut had been made through the middle ground by a lumber company in days gone by, and by using it some money could be saved in dredging.

For this line extra heavy, 4-inch line pipe, threaded, but without couplings, was used, and a style 3 Dresser river sleeve for the joints. This sleeve is designed for use on river lines, and experience with several styles of sleeves demonstrated that preference should be given it over the common screw-coupling with the split sleeve used for protection. It is made with the center of the sleeve reduced and threaded so that pipe can be screwed in as in any screw coupling. The ends of the sleeve are packed with V-shaped, rubber rings, which positively stop whatever leakage might be at the threads. The sleeve weighs approximately 70 pounds, and serves as an anchor to hold the line on the bottom of the river.

A Rand Drill Company's 12 by 16 by 16 compressor with a 6-inch outlet was purchased and installed in the exhauster room at the gas works. This was one of the first things done, for we desired to use the compressor in testing out the line as it was made up. A Johnson-Reynolds' regulating station was used to cut the pressure from 20 pounds—the pressure maintained at the gas works—to 30-tenths inches water pressure on the west side. In view of the fact that no decided grade or fall was necessary for this line, the only credging to be done was across the ship channel, where it was thought best to lay the line at a depth greater than any to which the channel might eventually be made.

An entirely different method from that used in laying the low pressure, 12-inch line was decided upon in laying the new line. A float about 12 feet by 16 feet was made of timbers, and on this float the line was made up. After a length of pipe was screwed up and the joint tested, the float would be pulled ahead, allowing the line to settle in the water. This operation was continued throughout the laying of the line. While the pipe was found to bend easily—that is, 2 or 3 feet in 100—it was found necessary to bend some lengths at the blacksmith's to conform with any decided or sudden drop of the river bottom.

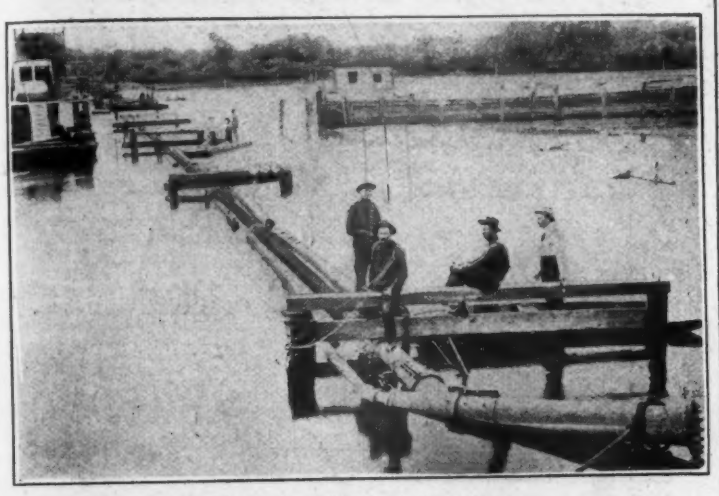
Only 3 or 4 piles were required in laying this line to keep the pipe in the cut dredged for it. These piles, with the aid of anchors, also served to hold the raft in place while screwing up the pipe. No fittings of any kind other than the sleeves were used on the line, the pipe being bent in all cases where a bend was necessary. About 6 men were required to lay the line and 1 week's time was taken from the day when the work was started on the river until the line was completed. The connections on the west side were made by using a 12 by 6 split tee; the trunk line connected into being a 12-inch line and the outlet of the governor being 6 inches. The accompanying photographs were taken during the laying



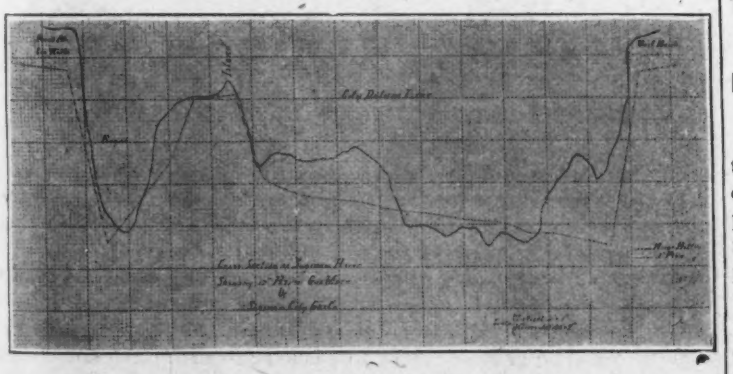
Scene Across Bayou, Middle Ground and Channel.

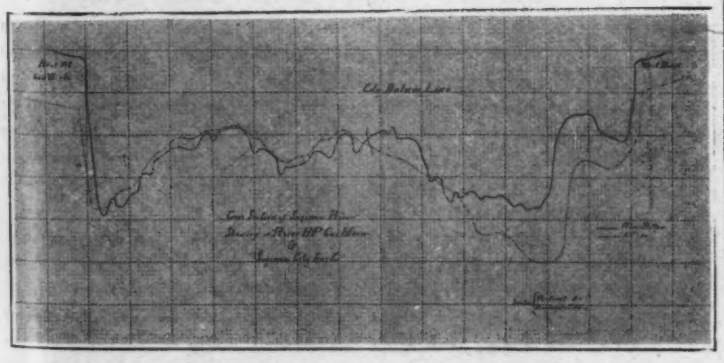
of the 12-inch line, and serve to show how the pipe was made up on the middle ground, how the pipe was floated with the aid of cedar poles, and how the pipe was evenly lowered. The detailed shore plan of the 12-inch line shows how the shore connections were made, also how connections were made for the drips at the east and west bank, these points being the low points of the line, and also shows the connections across the middle ground. The profile of the 12-inch line shows how perfect

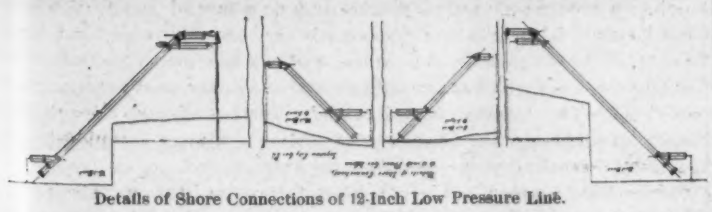
Making up Pipe on Middle Ground



Line Made up Previous to Lowering.







Details of Shore Connections of 12-Inch Low Pressure Line.

is the fall or grade of the line from the island or middle ground to the east bank or the gas works and to the west bank. The profile of the 4-inch, high pressure line shows the amount of dredging required to get the line to the proper depth desired in the channel; also the abrupt bends where the services of a blacksmith for bending the pipe were required.

There has, as yet, been no occasion to use the 4-inch line 24 hours through, but it has been used from 10 to 14 hours to test out the working of the governor on the west side, and also to test for the reliability of the compressor. Upon several occasions it has been shown that this 4-inch line does not leak, for after the compressor was started and the gauge on the line indicated 20 pounds pressure, a valve at the inlet of governor was opened and no water was blown out Regarding operating, the only expense of the 12-inch line is the time required of a man twice a day to pump the drips. This daily pumping is not absolutely necessary as the drips will hold enough water for almost a month's run, but for precaution's sake it is considered safe and wise. The 4-inch line when in use requires the services of an engineer and steam to operate the compressor, So while the first cost of a low pressure line is greater than that of a high pressure, it is the operating factor that should be considered. For comparison the cost of the two lines is hereunder given. The cost of the low pressure line, of course, does not include the first attempt and failure.

Twelve-inch Low Pressure Line.

Pipe	$2,946.00
Sleeves	304.00
Dredging	1,546.00
Marine diver	164.00
Lighters and boats	899.00
Sundries	1,024.00
Labor	1,493.00
Total cost	$8,376.00

Four-inch High Pressure Line.

Pipe	$845.00
Sleeves	280.00
Compressor	1,139.00
Regulator station	200.00
Dredging	813.00
Sundries	279.00
Labor	664.00
Total cost	$4,220.00

The Laying of Mains and Services and the Recording of Same.

[A paper read by MR. JOHN HELLEN, of Grand Rapids, Mich., at the Eleventh Annual Meeting of the Michigan Gas Association.]

In presenting this paper on "The Laying of Mains and Services and the Recording of Same," I feel keenly my inability to satisfactorily discuss it with the familiarity that it deserves, being as it is one of the important departments of the gas business, and upon the proper management of which greatly depends the commercial success of a gas company. The gas business, like any other, is conducted for the profit that there may be in it, and after gas which brings comfort to so many people in a multitude of ways, is economically manufactured it becomes necessary to carefully distribute it. This requires much care and attention and a thorough and practical knowledge of gas distribution.

The street or underground system of mains and services should be clearly shown and explained on maps, upon which should be recorded all mains and services, alive or dead, drips, valves, street lamps and connections of every description; also the sizes of mains and whether cast or wrought iron, distance from property lines, measurements to specials, size of services to point of entrance into building, and in fact all data that will clearly show the exact location and kind of pipes.

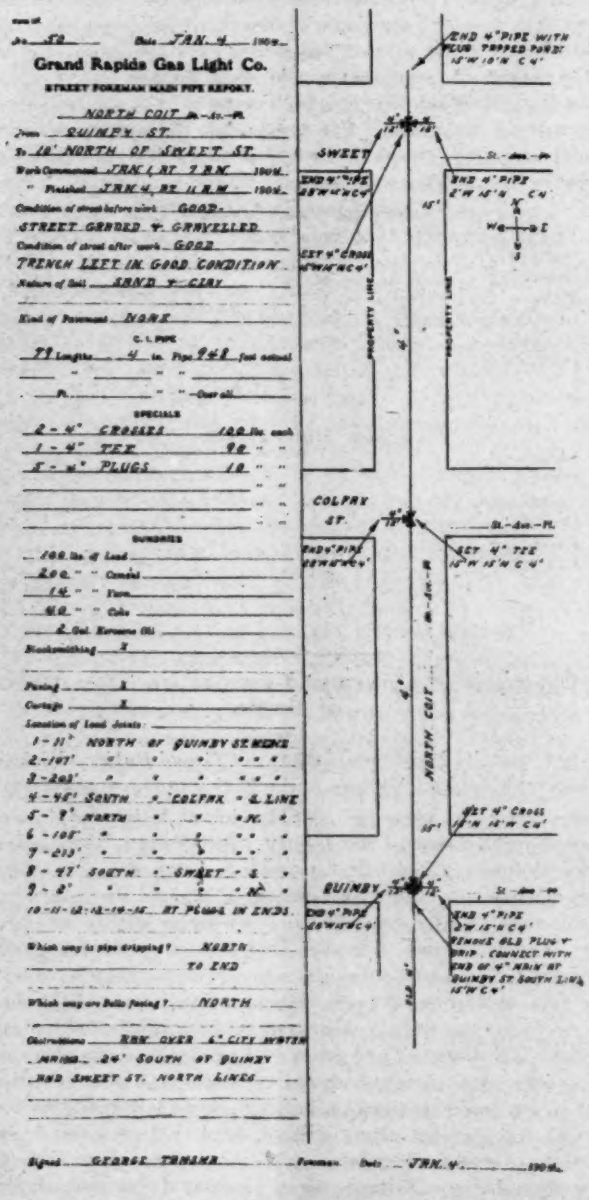
Much of this work may seem of slight importance to many, but when the value of time lost in attempting to locate underground work, the liability of duplicating work already completed, and the possibility of costly errors being made are rightly considered, the possession of a map system giving complete information cannot be too highly valued.

Main Orders.—When a petition is presented for, or the distribution department recommends, the laying of a main on a certain street, a new business solicitor circulates a petition among the residents of such street, and secures as many signatures of prospective consumers as possible. If he gets an average of one consumer for each 100 feet of proposed main, the petition is returned to the superintendent of distribution, who then prepares an estimate giving the amount and size of pipe required, the estimated cost, the number of lots on the line of proposed main, number of houses, flats, or tenements, number of prospective consumers, and estimated consumption for first and second years, etc. This estimate is submitted to general manager and when approved a

new business solicitor goes over the street a second time, and closes contracts for services, meter, house piping, fixtures, ranges, etc., secures a payment on each, and if sufficient contracts are taken to average one consumer to each 100 feet of main to be laid, the prospective consumers are informed as nearly as possible of the date when the proposed work will be completed.

The superintendent of distribution secures a proper permit from the city for the opening of this street, and will make a material order for the pipe, specials and other material necessary for the completion of the proposed main, and the articles covered by the material order will be delivered on the street at the time specified therein.

The instructions to street foreman for main work is given on Form No. 157, on which the superintendent of distribution or his clerk has,


Grand Rapids Gas Light Co.
STREET FOREMAN MAIN PIPE REPORT.
NORTH COLT
From QUIMBY ST.
To 10' NORTH OF SWEET ST.
Work Commenced JAN. 1 AT 7 A.M.
Finished JAN. 4 AT 11 A.M.
Condition of street before work GOOD.
STREET GRADED & GRAVELLED.
Condition of street after work GOOD.
TRENCH LEFT IN GOOD CONDITION.
Nature of Soil SAND & CLAY.
Kind of Pavement NONE.
C. I. PIPE
72 Lengths 4 in. Pipe 948 feet actual
SPECIALS
2 - 4" CROSSES 100 lbs. each
1 - 4" TEE 90 " "
5 - 4" PLUGS 10 " "
SUNDRIES
100 lbs. of Lead
200 " " Cement
14 " " Yarn
40 " " Oils
2 Gal. Kerosene Oil
Blacksmithing 2
Paving 2
Curbing 2
Location of Lead Joints
1 - 11' NORTH OF QUIMBY ST. MAIN
2 - 107' " " " " "
3 - 203' " " " " "
4 - 47' SOUTH " COLFAX " C. LINE
5 - 9' NORTH " " " N.
6 - 105' " " " " "
7 - 213' " " " " "
8 - 47' SOUTH " SWEET " S. "
9 - 2' " " " " N. "
10-11-12-13-14-15 AT PLUGS IN ENDS.
Which way is pipe dripping? NORTH TO END
Which way are Bells facing? NORTH
Obstructions NEW OVER 4" CITY WATER MAIN 24' SOUTH OF QUIMBY AND SWEET ST. NORTH LINES
Signed GEORGE TAMAMA Foreman. Date JAN. 4 1904.
END 4" PIPE WITH PLUG TAPPED POINT 15'W 10'N C4'
SWEET
END 4" PIPE 25'W 15'N C4'
END 4" PIPE 2'W 15'N C4'
SET 4" CROSS 15'W 15'N C4'
PROPERTY LINE
COLFAX ST.
END 4" PIPE 25'W 15'N C4'
SET 4" TEE 15'W 15'N C4'
NORTH COLT
SET 4" CROSS 15'W 15'N C4'
QUIMBY
END 4" PIPE 25'W 15'N C4'
REMOVE OLD PLUG & DRIP. CONNECT WITH END OF 4" MAIN AT QUIMBY ST. SOUTH LINE 15'W C4'

from the records of the Company, indicated the point where he shall begin laying the pipe, and the place it will end, and the distances from property lines the city permit has located it. When the work is finished, the foreman completes the report (Form No. 157), giving all the information requested, and if any change has been made in the location of the main from that indicated in the order, he will also note such changes, and show correct measurements.

From these street foreman's reports, the superintendent or a clerk will make a report of the job on Form No. 18, showing location of main, specials, etc., by measurements from property lines, and will add all miscellaneous information, and show the amount of pipe laid and cost of labor and material. These reports are recapitulated for a yearly report which shows the number of feet of each size of main laid, the cost of pipe, specials, labor and miscellaneous items, the total cost, and the average cost per foot. Form No. 157 is filed as original entry, and Form 18 as a detailed record of the Company.

Service Orders.—Service orders are made on Form No. 5-A, are dated on the day received, and contain the street and number, name of

Form 18. M. 1903 R.R.

Grand Rapids Gas Light Company

Date JANUARY 4 1904.

No. 50

Street Main Report

Of 948 ft. 4 in. Main Pipe laid in NORTH COLT AVE. Street.

Of ft. in. " " " in.

From QUIMBY ST. To 10' NORTH OF SWEET ST.

Work Commenced JAN. 1 AT 7 A.M. 1904 Finished JAN. 4 AT 11 A.M. 1904

Nature of Soil SAND AND CLAY

Condition of Street before work GOOD GRADED AND GRAVELLED

" " " after " " TRENCH LEFT IN GOOD CONDITION

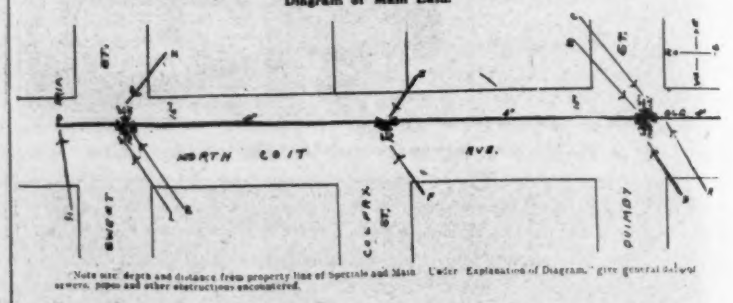
Average number of men employed @ average wages per day, not including foreman

Explanation of Diagram.

A Removed plug and drip on end of old 4" pipe.
B Set 4" cross at Quimby St. 15' north, 15' west, cover 4'
C Ran 12' of 4" pipe east from cross, end 2' west, 15' north, cover 4'
D Ran 12' of 4" pipe west from cross, end 25' west, 15' north, cover 4'
E Set 4" tee at Colfax St. 15' west, 15' north, cover 4'
F Ran 12' of 4" pipe west from tee, end 25' west, 15' north, cover 4'
G Set 4" cross at Sweet St. 15' west, 15' north, cover 4'
H Ran 12' of 4" pipe east from cross, end 2' west, 15' north, cover 4'
I Ran 12' of 4" pipe west from cross, end 25' west, 15' north, cover 4'
J End of 4" main 10' north of Sweet St. north line, 15' west, cover 4'
K
L All pipe drips north to end where drip is placed.
M All bells face north
N Location of Lead Joints
01- 11' north of Quimby St. 6- 105' north of Colfax St.
02- 107' " " " " 7- 213' " " " "
03- 203' " " " " 8- 47' south of Sweet St. south line
04- 95' south " Colfax " 9- 2' " " north "
05- 9' north " " " 10-11-12-13-14-15- At plugs in ends

APPROVED John Mellen Supt. SIGNED George Tamama Foreman

Diagram of Main Laid.



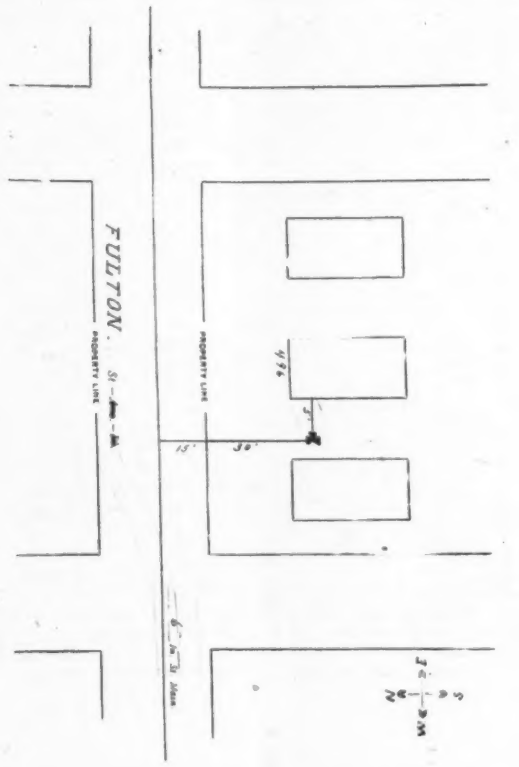
Note size, depth and distance from property line of Specials and Main. Under Explanation of Diagram, give general location of sewers, pipes and other obstructions encountered.

owner and occupant of the property, the size and kind of street main, the depth below surface, and the location in the street, and whether the service is to be extended from a stub or a tee the location of the fitting is shown on the back of the order. The service foreman reports all material and labor used for the completion of the service, signs and dates it on the day the work is completed and returns to superintendent. A repair service order is given on Form No. 5-B, contains the same information as a new order, and is to be treated in the same manner.

Drip Orders.—Drip orders, both new and old, are given on Form 5-C, or if a drip is removed or abandoned it is reported on this same form with full explanation. Drips are numbered consecutively, and their location numbers are given them at the time they are recorded on the reference maps. It is our custom to pump all drips at least twice each year. Some, however, need pumping more frequently; these are designated as "active drips." A record is maintained showing all water in gallons pumped from each drip.

Maps.—The maps used for recording the details of mains, specials, drips, valves, services and street lamps are "insurance maps," drawn to a scale of 50 feet to the inch. On the maps are shown all buildings, and their construction and location on lots as well as width of streets and alleys. On tracings of city maps, to a scale of 800 feet to the inch, we record on one, all mains, and on a second mains of 6 inches and larger. Blue prints of these maps are used by the several departments of the Company, and at the end of each year, the mains laid during the current year are added to the tracing, and new prints are provided. The forms referred to and a section of map are submitted herewith and they are duplicates of orders and work completed, being copies of a portion of our records.

Main Pipe Laying.—It having been determined to lay a street main, the order has been given to street foreman, the material delivered and the time has arrived to start the work. Measurements are taken to lo-



Form B A.
GRAND RAPIDS GAS LIGHT CO. ORDER—New Service.

Location 496 FULTON STREET
No. 378 Date JANUARY 1 1904
Lay Service for GEORGE FULLER Occupant
Owner.

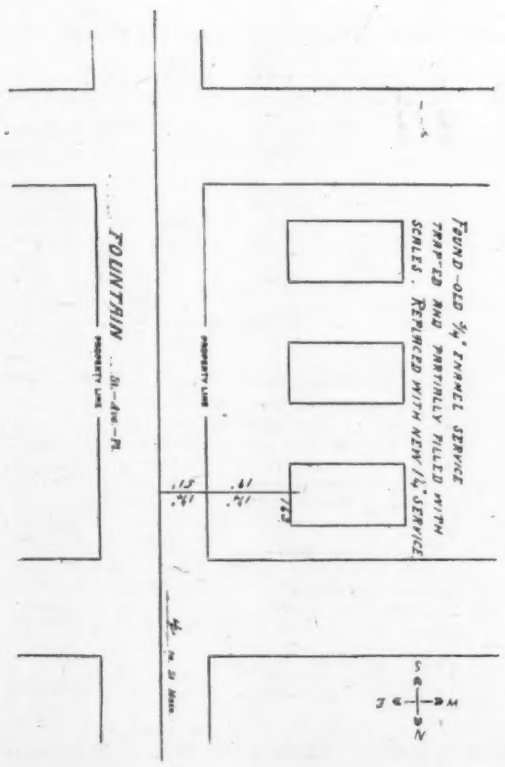
MATERIAL AND LABOR USED.

50 ft. of	1¼ in. Pipe	@		2 25
		@		
		@		
		@		
	Total Pipe			
9	1¼ in. Fittings	@		39
		@		
		@		
		@		
	Total Fittings			
	in. Union Com. Pat.	@		
		@		
50 ft. of	4 in. Strips	@ 15 PER M		75
		@		
1	1¼ in. Service Cocks	@ .43		43
4 Gals. of Tar		@ .06		24
	Total Sundries			1 42
	Total Material			
25 Hours Labor		@ .17½		4 37
		@		
5 " Foreman		@ 22½		1 13
		@		
	Total Labor			5 50
	Total Expense			

CHARGED CUSTOMER.

ft. of	in. Pipe	@		
		@		
		@		
	Total Charge Customer			

¾ in C. I. Main 4 ft. deep New, Old
Location of Street Main 15 ft. NORTH of property line
Main Drips to WEST Street
Finished JAN 4 1904 by FRANK CULLIGAN Foreman.



OLD ¾" SERVICE TRAPPED RUN NEW 1¼"

Form B B.
GRAND RAPIDS GAS LIGHT CO. ORDER—Repair Service.

Location 163 FOUNTAIN ST.
No. 190 Date JAN. 4 1904
Lay Service for JAMES MUNROE Occupant
Owner.

MATERIAL AND LABOR USED.

70 ft. of	1¼ in. Pipe	@ .06½		4 55
		@		
		@		
		@		
	Total Pipe			4 55
7	1¼ in. Fittings	@ .06½		46
		@		
		@		
		@		
	Total Fittings			46
	in. Union Com. Pat.	@		
		@		
70 ft. of	4 in. Strips	@ 15 PER M		1 05
		@		
1	1¼ in. Service Cocks	@ .43		43
5½ Gals. of Tar		@ .06		33
	Total Sundries			1 81
	Total Material			6 72
35 Hours Labor		@ .17½		6 12
		@		
6 " Foreman		@ 22½		1 35
		@		
	Total Labor			7 47
	Total Expense			14 29

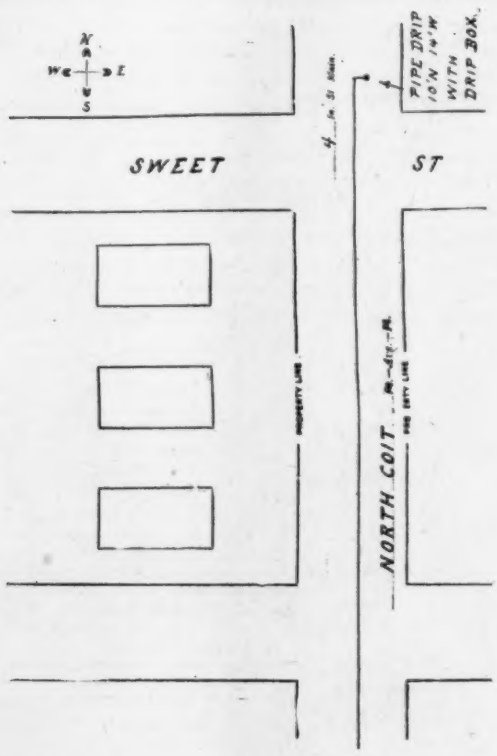
CHARGED CUSTOMER.

ft. of	in. Pipe	@		
		@		
		@		
	Total Charge Customer			

¾ in C I Main 4 ft. deep New, Old
Location of Street Main 15' WEST OF EAST of property line
Main Drips to Street
Finished JAN 4 1904 by LEVI GREEN Foreman.

cate the old pipe or special which is to be the starting point. The trench is lined out, the men placed and work begins. For 4-inch, 6-inch and 8-inch pipe, the trench should be made from 24 inches to 30 inches in width. For larger mains, the width of trench will be increased proportionately. The men should be instructed to excavate the ditch closely as lined out. The top gravel, stone or other pavement should be thrown on one side of the trench, and earth below the top coating or pavement to be thrown well back from trench on opposite side. If soil is gravel, sandy or loose loam, the trench should be well planked and braced to prevent caving in. When bracing is necessary, it should be very carefully done, not only that expense may be saved in digging, but for protection to the men at work in the ditch. When the trench is in clay or solid earth, little or no danger is to be apprehended from caving, and bracing can safely be dispensed with. The desirable depth of the trench depends almost entirely on the climate and obstructions from pipes and conduits previously laid in the streets. Our custom is to provide such depth as will give about 4 feet cover. This we deem sufficient for protection from frost, and provides ample drip for services.

If the main is to be laid on inside of curb or in the gutter, the pipe should be distributed on opposite side of the street. If laid between gutter and center of the street, it saould be distributed on the same side of the street on which it is to be laid, bells to face in the direction in which the work is to proceed, specials to be distributed at or near the point where they are to be used. Cement, lead, yarn coke, oil, etc., are delivered when required as the work progresses. The trench laborers are placed from 9 to 12 feet apart, according to the kind of soil, the number of men and the amount of trench allowed open. Before placing in the trench, all pipe should be carefully examined, and must be clean on the inside, and tested with hammer to locate any defect or weakness. A sound pipe, when struck with a hammer, gives a clear, metallic ring, while a split or defective one will give a dead or rattling sound. Before drawing the plug, or making the opening for the place of beginning, all



REMOVE

Form 7 C. ORDER.

GRAND RAPIDS GAS LIGHT CO. New or Repair. Drip.

Location NORTH COIT AVE.
AT SOUTH LINE OF QUIMBY STREET.
14' WEST OF NORTH COIT AVE. EAST LINE.
No. To Date JAN. 1 1904

MATERIAL AND LABOR USED.

ft. of	in. Pipe @		
"	" " @		
"	" " @		
	Total Pipe		
	in. Fittings @		
	" " @		
	" " @		
	Total Fittings		
of	in. Union Com. Pat. @		
ft. of	in Strips @		
Gals. of Tar	@		
Drip Box, Light or Heavy	@		
Drip Pot	Gals. @		
	@		
	Total Sundries		
	Total Material		
Hours Labor	@		
" Foreman	@		
	Total Labor		
	Total Expense		

4 in. C. I. Main 4 ft. deep New Old
Location of Street Main 14 ft. WEST of property line
Main Drip to Street
Finished JAN. 1 1904. by GEORGE TANAMA Foreman.

Form 7 C. ORDER.

GRAND RAPIDS GAS LIGHT CO. New or Repair. Drip.

Location NORTH COIT AVE.
10' NORTH OF SWEET ST. NORTH LINE
14' WEST OF N. COIT AVE. EAST LINE
No. 314 To Date JAN. 1 1904

MATERIAL AND LABOR USED.

5 ft. of	1 in. Pipe @ .04½		23
"	" " @		
"	" " @		
	Total Pipe		23
4	1 in. Fittings @ .05		20
1	¾ " " @ .03		03
	" " @		
	Total Fittings		23
of	in. Union Com. Pat. @		
ft. of	in Strips @		
½ Gals. of Tar	@ .06		02
1 Drip Box, Light or Heavy	@ .75		75
Drip Pot	Gals. @		
	@		
	Total Sundries		77
	Total Material		1 23
1 Hours Labor	@ .17½		18
1 " Foreman	@ .22½		22
	Total Labor		40
	Total Expense		1 63

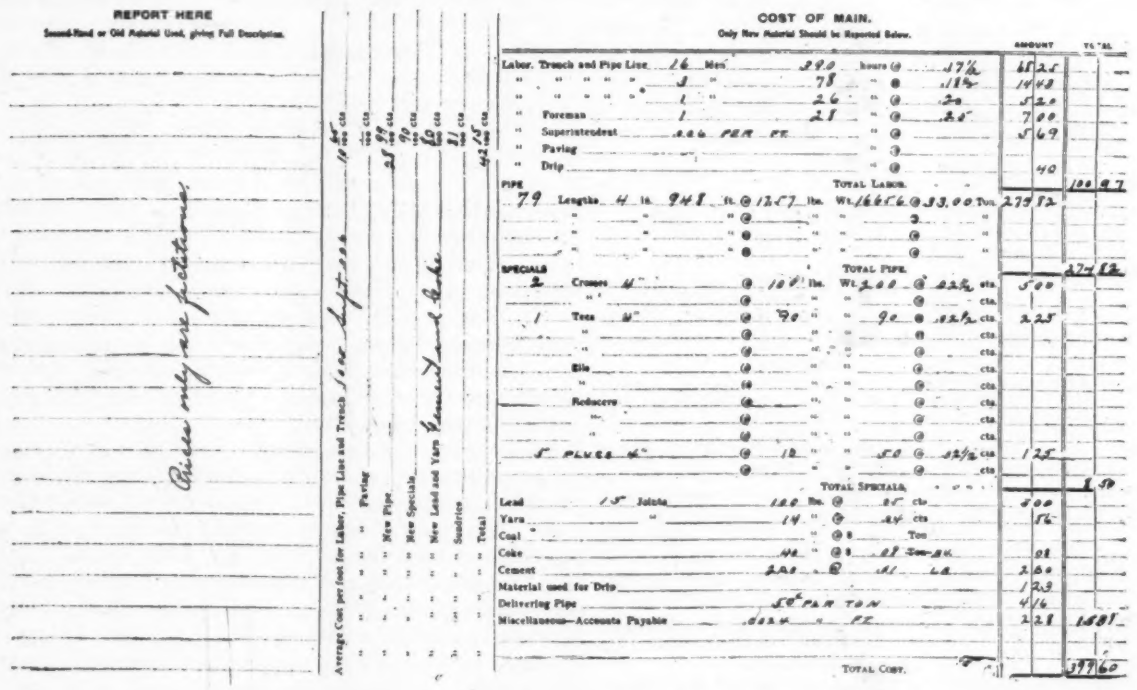
4 in. C. I. Main 4 ft. deep New, Old
Location of Street Main 15 ft. WEST of property line
Main Drip to 1 Street
Finished JAN. 4 1904. by FRANK BEARD Foreman.

live connections to opening should be well bagged off to prevent unnecessary danger from escaping gas.

To bag a main, tap a hole of sufficient size 2 or 3 feet back of proposed opening, insert the bag or bladder, and inflate, but be sure that no gas is passing the bag before making the opening. For mains of 10 inches and upward, I would recommend the use of a gas main stopper, as I consider it more safe than a bag of that size. The bagging off being completed and the opening made, the main laying may be begun. Insert the spigot end of pipe well back to the shoulder of the bell of pipe or special, as the case may be. When 3 lengths of pipe are placed in ditch and yarned, the joint maker may begin his work. Formerly all joints were made with lead, but on account of being able to secure a more satisfactory joint cement is used by us almost entirely. Lead, however, is used at plugs that they may be easily drawn, and at about every 8th joint to allow for expansion and contraction. The pipe layer should be an exceptionally careful man. He must see that the trench is not dug too deep, that the pipe is laid on a solid earth bottom, that bell holes are made large enough to permit joints being properly made or calked on bottom. Mains must be laid to certain grade, and when properly placed will have an uninterrupted fall or drip to the lowest point. Use the spirit level on every length of pipe, and see that the desired grade is preserved. At least ¼-inch fall to each 12-foot length of pipe is desirable.

In leveling up or placing pipe in the ditch, never use blocking of any kind, as it prevents equal settlement of the pipe. If blocking is used, so much strain is thrown on the pipe at particular places that danger of broken mains is increased. Drips should be avoided wherever possible, for the more drips in the main system the more labor is required to care for them. Do not, however, with the idea of saving pumping labor, leave a main without a drip where from any reason a drip has been formed or a perfect flow cannot be obtained to a lower point.

Iron drip pots holding 5 gallons or more should be used on all drips except on ends of mains where extensions are liable to be soon needed. As fast as joints are completed back filling should begin. Earth should be well tamped around and under the pipe, precaution being used not to strike the pipe or joints before they are fully covered. When the main


REPORT HERE
Second-Hand or Old Material Used, giving Full Description.

Ridden only rock bottom.

Average Cost per foot for Labor, Pipe Line and Trench 1/16 deep

Paving
New Pipe
New Specials
New Lead and Yarn
Sundries
Total

COST OF MAIN.
Only New Material Should be Reported Below.

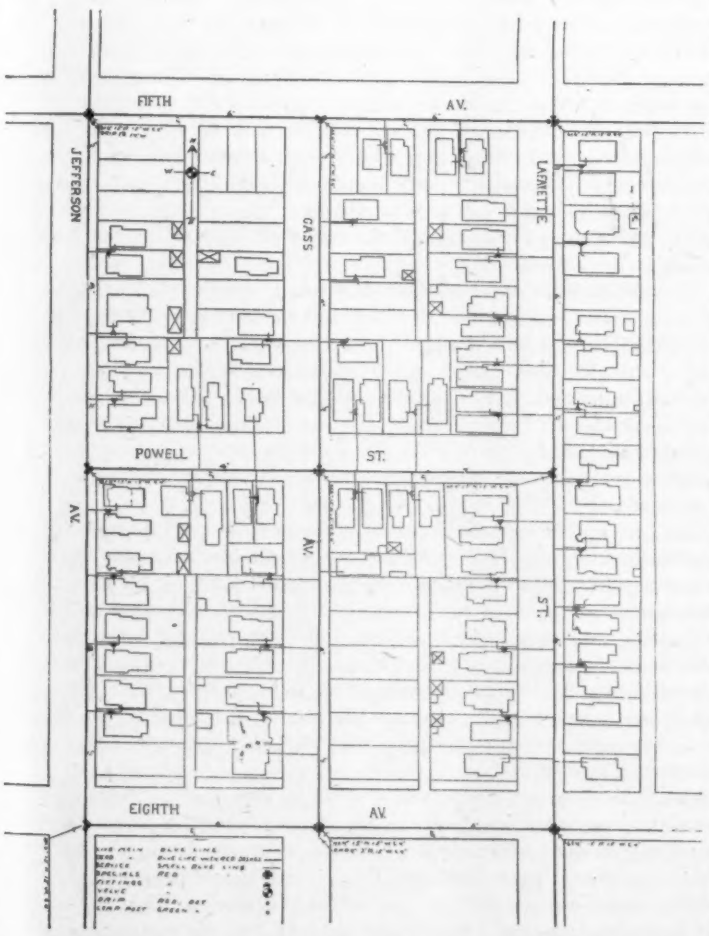
AMOUNT

Labor. Trench and Pipe Line. 16 Men 390 hours @ 17½ 68 25
" " " " " 3 " 78 " @ 18½ 14 40
" " " " " 1 " 26 " @ 20 5 20
" Foreman 1 25 " @ 28 7 00
" Superintendent 2.66 PER FT. " @ 5 69
" Paving " @
" Drip " @ 40
TOTAL LABOR. 100 94

PIPE
79 Lengths 4 in. 941 ft. @ 12.57 lbs. Wt. 16656 @ 33.00 Ton 274 82
" " " " @ " " " @ "
" " " " @ " " " @ "
TOTAL PIPE. 274 82

SPECIALS
2 Crosses 4" @ 10.9 lbs. Wt. 2.00 @ 22½ cts. 5 00
" @ " " " @ cts.
1 Tees 4" @ 90 " 90 @ 12½ cts. 2 25
" @ " " " @ cts.
" @ " " " @ cts.
Ells @ " " @ cts.
" @ " " @ cts.
Reducers @ " " @ cts.
" @ " " @ cts.
" @ " " @ cts.
5 PLUGS 4" @ 10 " 50 @ 12½ cts 1 25
" @ " " " @ cts
TOTAL SPECIALS. 8 50

Lead 1⅝ Joints 120 lbs. @ 5 cts 6 00
Yarn " 14 " @ 25 cts 1 50
Coal @ $ Ton
Coke 40 @ $ 25 Ton 84 lbs. 01
Cement 200 @ 11 Lbs. 2 50
Material used for Drip 1 25
Delivering Pipe 50 PER TON 4 16
Miscellaneous—Accounts Payable 802 M " FT 2 25 18 91
TOTAL COST. 399 60



is laid it is important that the gas bag be removed slowly, and the air contained in the new main forced out through holes tapped in the pipe. Trenches left open over night should be well protected and fenced off with trench fencing strips, and sufficient lanterns with red globes placed on the fencing to prevent accidents.

To leave a street in good condition, it is absolutely necessary that the back filling of the trench be properly executed. In back filling not more than 3 inches to 6 inches of earth, according to its character, should be placed in the trench, and this thoroughly tamped and packed down before another layer is thrown in, and the top dressing of a graveled street, or the paving of a paved street, should be left in the best condition possible. The public have a right to expect a corporation to leave a street which they have opened in as good condition when the work is completed as when started.

The superintendent having the interest of his company at heart will see that there can be no just complaint made of the manner in which the public streets and highways are left by his foreman. If for any reason a trench should settle or not remain in good condition, it is the duty of the company to have the street repaired without question and promptly.

Service Pipe Laying.—The subject of services, their proper size and protection from oxidation and electrolysis, is of such importance that no detail of construction should be overlooked or neglected. Small services cause trouble, and none should be run under 1 inch in size, 1¼ inches being preferable. The service foreman before beginning the laying of a service should verify the record as shown on his order by making an examination of the building and ascertaining beyond a doubt whether a service has not already been laid. A material order for stock for from 1 to 16 services is made, and when the material is delivered to foreman, he checks it and receipts for same, the amount of material delivered to foreman at one time being based on the bunching of service orders for one locality.

As in main laying, the top gravel or paving should be thrown on one side of the ditch, and the earth well back from the trench on the opposite side. When necessary, plank and brace trench as in main laying. When laying a service through a lawn, the sod should be carefully cut in squares with a sod cutter or spade, and placed on one side of trench, grass down, and canvas blankets placed on opposite side on which the excavated soil is thrown, the top soil being placed on the outer edge of the blankets. The balance of the earth is thrown on the blankets, and kept separate from the top soil as much as possible, so that it can be put back in its original place when the trench is filled. The use of canvas blankets protects lawns from damage, and makes it possible to put back a trench in such condition that it is with difficulty distinguished from the balance of the lawn.

After the main is tapped, the service should be connected by means of a street tee, and a street elbow. By using a connection of this kind, any desired pitch can be obtained without placing a strain on either main or service. All pipes and fittings should be carefully examined for sand holes, stoppages, and split pieces before being used, and all pipe threads and fittings to be well leaded. All services should be protected with a coating of some kind. Grand Rapids boxes and tars all services. The form of a box used is that of a letter "V" with a cover, and is made of 4-inch, undressed white pipe strips. After the "V" portion of the box is placed around the pipe, coat with coal tar, then fill the box with a mixture of coal tar and sand. The cover is then placed on the box.

A stopcock and tee are placed on the end of the service just inside of the building. If the building is a factory or large business block, a stopcock and shut-off box should be placed in the ground outside of building that gas may be turned off in case of fire; this in addition to the cock on end of service inside of building. When the distance is 100 feet or less from property line to building, services are run free of

charge to consumer. Wherever practicable or convenient, supply two houses with same service by running it as near as possible on the dividing lines of the lots (see map). Street, lawn and foundation wall should be left in as good condition as when work started. On completion of a service, the foreman will fill out the service order in full and return to superintendent. Attached herewith is a list of main and service tools as used by us.

Street Main Tools.—The following is a list of street main tools for a gang of about thirty men:

One tapping machine with taps 1 to 2 inches.
Two 18-inch trimo wrenches.
Two 12-inch monkey wrenches.
Three calking hammers.
Four cast iron pipe cutting hammers.
One 10-pound machine hammer.
One sledge hammer.
One 14-pound stone hammer.
Two paving hammers.
Eight calking irons, different thickness.
Three yarning irons.
Twelve 7-inch cold chisels.
Ten diamond-pointed chisels.
One chain wheel iron pipe cutter.
Three 2-foot steel bars.
Two 5-foot crowbars.
Five 4-foot tie tamping bars for tamping dirt under mains.
Five 5½-foot tunneling bars.
Six 4-inch trowels.
One 10-inch trowel.
Two 8-inch iron spirit levels.
One pair steelyards.
One iron pipe oiler.
Two hand saws.
Three axes.
Fifteen street lanterns, with red globes.
Four heavy wood dirt pounders.
Ten iron plug dirt pounders.
One 3-gallon kerosene oil can.
One small funnel used for filling street lanterns with oil.
One 15-inch × 30-inch galvanized iron cement can.
Four long-handled shovels used for tunneling.
One 100-foot metallic tape measure.
One 50-foot metallic tape measure.
Three large hoes for scraping the street.
One wheelbarrow.
Fifty adjustable iron trench braces.
One salamander furnace with lead kettle for same.
Two lead kettles for pouring hot lead for pipe joints.
Two pieces of 1-inch manila rope, each 30 feet long, used for lowering 6, 8, and 10-inch pipe into trench.
One wheel derrick, and 10-inch tackle block with rope for handling large stone in trench, also for lowering 12-inch pipe and larger into trench.
One 18-foot length of log chain, with ring and hook on ends.
Ninety railroad picks.
Forty pick handles.
Fifty planks for trench shoring.
Fifty trench fencing strips.
Fifty trench fencing strip supports.
One box for gas bags.
Four earthenware iron pots for mixing cement in.
One tool box, 6½ feet long and 3 feet wide.
One tool box, 4 feet long and 2½ feet wide.
Three pairs of rubber gloves.
Rubber gas bags for different size mains.
Wood plugs for different size mains.
Iron bell plates and clamps for different size mains.
Main pipe tool wagon.

Service Tools.—The following is a list of service tools for a gang of about 12 men:

One tapping machine with taps ¾ to 2-inch.
One stock with dies and guides ¾ to 2-inch.
One Barnes No. 2, 3-wheel iron pipe cutter.
One iron pipe vise.
One iron pipe reamer.
One 18-inch iron spirit level.
One 24-inch trimo wrench.
Two 18-inch trimo wrenches.
One 14-inch trimo wrench.
One 12-inch monkey wrench.
One machine hammer.
One calking hammer.
One 14-pound stone hammer.
One sledge hammer.
One paving hammer.
One claw hammer.
One broad hatchet.
One axe.
One ratchet brace.
One 1-inch wood bit.
One 1¼-inch wood bit.
Two hand saws.
One keyhole saw.
Four cold chisels.
Three calking irons.
One yarning iron.
Two 2-foot steel bars.
Four 6-foot tunneling bars.
Four 4-foot tie tamping bars for tamping dirt under services.
One 5-foot crowbar.
Two 4-inch trowels.
One 10-inch trowel.
Six iron plug dirt pounders.
Two heavy wood dirt pounders.
Ten lanterns with red globes.
One iron pipe oiler.
One 2-gallon kerosene oil can.
One 1-gallon lard oil can.
One 1-gallon boiler oil can.
One 15-inch x 30-inch cement can.
One 100-foot metallic tape measure.
One 50-foot metallic tape measure.
Thirty-six railroad picks.
Fifteen pick handles.
One 18-foot length of log chain, with ring and hook on ends.
Two long handled shovels for tunneling.
One spade.
One sod cutter.
Twelve adjustable iron trench braces.
Twelve trench fencing strips.
Eighteen trench fencing strip supports.
Ten planks for trench shoring.
Seven 7 x 15-foot canvass blankets.
One tool box, 6½ feet long x 2½ feet wide.
One tool box, 2½ feet long x 1½ feet wide.
One service pipe tool wagon.

The above is a brief summary of the methods of main and service laying and the recording of same as used by us in Grand Rapids, and which we have found to give the best of satisfaction.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, Feb. 10th., 1904.

A Gas Fire in London.—Long Distance Distribution.—A Government Inquiry.—Proper Paints for Metals.

What an immense amount of wasted genius there is in the world? People whose ability to manage anything. from the weightiest affairs of State down to the sweeping of a crossing, rise far superior (in their own estimation) to that of the recognized authorities intrusted with the execution of the matters under view. Would the world be better, or worse, if such could be taken at their own valuation? In every town is to be found the man who, according to his own account, could sell gas at half the price, throw in double the quality, and pay much larger profits than the committee and managers who have grown gray in the service of the owners of the gas works.

These reflections are suggested by the attitude of some of the London papers towards the Gas Light and Coke Company in respect to an extraordinary casuality which lately occurred in a principal thoroughfare. A large hotel is in process of erection, and in addition to the scaffolding above ground the work includes considerable excavation for the basement below. A heavy steam crane was fixed on a temporary staging, and early one morning the scaffold collapsed, letting the ponderous machine with its boiler and furnace fall into the excavation. In doing so it broke away the struts and framing erected to keep up the sides, causing a considerable foundering of earth, and also struck a 6-inch gas pipe and broke it off. The escaping gas fired, probably from the furnace, which had been lighted in preparation for the day's work, and burned furiously. The soil continued to fall in, having lost the shoring provided for it, and a considerable length of a second line of gas main, 18 inches in diameter, was exposed. The combined action of the heat and the loss of support led to the collapse of some 80 feet of this large pipe, and a third pipe 4 inches in diameter was also involved. A tremendous blaze was the result, but the chief distribution engineer, Mr. G. F. L. Foulger, was soon on the spot with a large staff of men, and in about three hours the mains were safely plugged without further injury to life and property.

The method followed was to tap the broken pipes on each side as near to the fracture as possible and to insert rubber bags. These were inflated until only a comparatively small flame showed at the fractured part. The flame was smothered or beaten out, and as soon as it was quite extinguished the bladder was fully inflated. Of course the flame might have been extinguished by completely stopping off the gas, but it was thought that this would involve some risk of drawing air back and forming an explosive mixture in the space between the bag and the fracture.

The accomplishment of this work in a successful manner is creditable to all concerned, but it is not more than would be expected by all who know anything about the arrangements for maintaining the gas supply in the principal parts of the metropolis. If anybody is capable of dealing with a catastrophe of this sort, it is Mr. Foulger and his assistants, who successfully grapple with the supply of some 300,000 customers through about 3,000 miles of main. But the superior genius is in evidence, and wants to know why so much delay and trouble was taken, when the burning gas could have been dealt with in a few minutes by means of a load of wet sand.

The flow from an open 18-inch pipe is reckoned in hundreds of thousands per hour, and how to apply wet sand to a flame about 30 feet long, on the upper part of a treachereus broken bank, is not a very obvious matter. Then, of course, there is that grand panacea for every distribution trouble—shut the gas off at the works. That would certainly put the flame out, but I need not add that the remedy would be worse than the disease.

The occurrence is an example of the risks of civilization. It is more dangerous to erect scaffolding and to excavate in principal thoroughfares, with their complicated network of gas mains, water mains, electric cables, high pressure hydraulic system, telephone wires, compressed air, and what not, than on undisturbed soil in a country locality. And interference with one service involves disastrous consequences to the others. Gas escapes, electricity short circuits and ignites, high pressure pipes burst and so on, and one casualty may be the cause of several more. But for continual care and watchfulness on the part of authorities in our large cities, such casualties would be more frequent and more far reaching in their results.

An interesting installation of long distance distribution has been put down in Germany, comprising a main 12½ miles long and 3½ inches

diameter, a 3-horse power motor with an automatic contrivance that checks it when the pressure rises in the main, and a 14,000 cubic foot gasholder at the far end, from which the gas is delivered by an ordinary low pressure system. A separate gas works could have been provided at a less cost, but the working expenses would be very much greater. The cost of the whole was £11,000, and the terms arranged for the supply of 5,000,000 cubic feet per annum give promise of a profit of nearly £1,000 per annum, so there will be a balance to the good after providing for interest and depreciation. There is also a prospect of supplying other townships from the same main. The main is constructed of Mannesmann tubes, 20 to 30 feet long, carefully coated with asphalt and wrapped in jute, tested up to 80 atmospheres, and the joints will stand 50 atmospheres. On testing after laying it was found to be gas tight.

The initial pressure was 5½ inches and the holder pressure 2 inches. The calculated delivery, according to the usual formula under these circumstances, would be 460 cubic feet per hour, and the actual delivery was found to agree closely with this; so that anything up to this limit can be supplied without working the pumps. But when the initial pressure was 60 inches the delivery was 2,472 cubic feet per hour, 530 cubic feet more than the calculated quantity. This pressure, it should be observed, is only a little over 2 pounds per square inch, and such a large addition to the theoretical delivery suggests the importance of careful experiments up to 10 or 20 pounds per square inch. Why such a large increase should be obtained is a matter involving considerable discussion. It agrees with the opinion held by most practical men and founded on their own observation that increase of pressure means an increase of delivery in a much greater ratio than that indicated by theory—viz., in proportion to the square root of the pressure, and shows that, while the well known Pole's formula may be practically correct under a few inches pressure, a very substantial correction is required at higher pressures, say 5 inches and upwards.

The Board of Trade have appointed a committee to inquire into questions relating to the quality and testing of the London gas supply. Their instructions are, to inquire and report as to the statutory requirements relating to the illuminating power and purity of the gas supplied by the Metropolitan gas companies, the methods now adopted for testing the same, whether any alteration is desirable in such requirement or method, and whether any consequential alteration should be made in the standard price of gas. The chairman of the committee is Lord Rayleigh, the chief gas examiner for the Metropolis, and the sole representative of the gas engineering element is Mr. William King of Liverpool. The other members appear to be mostly selected on account of scientific notoriety rather than for any practical acquaintance with the subject, thus perpetuating the error that has always seemed to prevail when government inquiries into this subject are on the carpet, and which may be described as too much of the scientific element. So long as gas held a monopoly and enjoyed a freedom from competition, the supplies were not particularly affected by sulphur clauses and a tax of about £10,000 per annum for the maintenance of the gas examiners and their laboratories. But things bear a different complexion now. Under the old regime it was simply a matter of another penny or two pence per 1,000 cubic feet on the gas, and if the consumers were satisfied there was no reason for the companies to complain. At the present juncture, however, it is unfair to handicap gas to the extent of even a penny per 1,000 cubic feet, and that for two reasons. First, there is the effect on the company and, secondly, that on the consumers. There is a great demand for cheaper gas, and there is the competition of petroleum, electricity and other things. It is obviously unfair to inflict costly, vexatious restrictions that may seriously hamper their choice of materials and methods, upon gas companies, while their competitors are absolutely untrammelled. And the cry for cheap gas is really due to the fact that more of it is used, and in connection with trade and manufacture even a penny per 1,000 cubic feet is a matter of moment. Under the modern system of working anything in the way of a testing station is a superfluity. Any deviation in respect to illuminating power or to purity becomes evident to users of large gas engines or atmospheric burners long before it can be detected in the laboratory. Gas companies, in short, cannot afford to send out bad gas, and therefore testing stations are unnecessary. It is a pity that some large users of gas are not represented on the committee. One can understand that a little suspicion of favoritism attached to engineers interested in gas supply, and that they are not likely to make rods for their own backs by assisting in formulating restrictions which may come round to their own particular district. But this objection cannot apply to the parties whose interests the committee are personally representing and who don't need the service of a scientific expert to tell them whether the gas is full value either as to quality or purity. Chemists are notoriously impractical, and they have exemplified as much in their previous dealings with coal gas supply. And the present committee are not likely to prove much assistance to either of the parties concerned.

The letter written by Mr. Frank P. Cheesman, of the National Paint Works, New York, and published in your issue of the 18th ult., page 91, appears to call for some notice as the writer takes exception to some statements made by me in an article on "Iron Roofs," contributed to the London *Journal of Gas Lighting*, and subsequently reproduced in your columns. In the first place the writer appears to have overlooked the fact that it was specially addressed to British readers and deals with the materials and appliances in vogue here. Possibly those used in America may be of a different character to such an extent as to give widely divergent results. His remarks on linseed oil appear to warrant such a supposition and the painting machine to which he alludes is evidently a very different article to that which I have used for several years past. I am sorry my experiences do not agree with those of the Association of Master Car Painters but must still hold to the statement that for holders' roofs and other flat work the machine is far superior to the brush. There is no difficulty in laying the paint evenly, and in thin or thick coats, and being injected with some force it fills up round rivet heads, laps of sheets, etc.; in a manner impossible of attainment with the brush. My machine has saved its cost over and over again.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We are indebted to the Detroit (Mich.) Stove Works for a copy of its new gas range catalogue (it is numbered 76) which is well worth a place in any gas man's current collection of matters for reference.

The following circular notice has been issued by Mr. B. E. Chollar, the terms of which are sufficiently clear to carry their own explanation: "The attention of gas companies is respectfully called to the Chollar Patent, No. 632,400, issued September 5, 1899, for an improved method of purifying gas. The method covered by this patent consists in effecting a flow of gas, having oxygen mingled therewith, through purifying material in one general direction, and then effecting a flow of gas, having oxygen mingled therewith, through the same material in a general direction to the reverse of the preceding flow. The advantages of this method of purifying gas are becoming well-known throughout the country, and the process is quite extensively used. A few infringements of this patent have sprung up, due no noubt to the fact that the gas companies were assured by the manufacturers of the apparatus designed to use my method that they would settle with me for its use; but that assurance does not relieve the gas companies from liability. I, therefore, take this means of advising gas companies that I shall have to hold them responsible where my method is being used without permission.—B. E. Chollar, 2840 Troost avenue, Kansas City, Mo."

The Xenia (O.) City Council has fixed the price at which gas for illuminating purposes may be sold in that city at the rate of $1 per 1,000 cubic feet, less 15 per cent. for prompt payment.

The following notice has been issued by the Cleveland (O.) Gas Light and Coke Company: "A gentleman in this city using natural gas in his cooking stove had also retained a connection with artificial gas to insure himself a supply in case of failure of natural gas. In some way both valves became open at the same time, and the natural gas, having a much greater pressure, forced itself into the artificial gas main and into the houses of neighbors. Their burners and stoves were not adjusted to this great increase of pressure and much inconvenience and some damage were caused, and serious trouble might have ensued. The Cleveland Gas Light and Coke Company hereby warns its consumers against the danger attending any combined use of our gas with that of the other company, and gives notice that it will not knowingly permit any such connections to be made unless a 3-way valve is used to prevent any possible mixing of the gases."

Mr. Eli Whitney, President of the New Haven (Conn.) Water Company, has been elected to the vacancy on the Board of Directors of the New Haven Gas Light Company, occasioned by the death of Professor Francis Wayland.

We are indebted to Mr. Fred. B. Wheeler, General Manager of the Binghamton (N. Y.) gas works, for a set of 8 photographs which show in detail the beauty and completeness of its new offices. There is no

need to say where or in what part of the city the offices are located; for all that visiting gas men have to do is to ask, having stepped from train or 'bus, "Where is the office of the gas works." The building is an addition pronounced to the public appearance of Binghamton's business quarters.

THE La Crosse (Wis.) Gas and Electric Company has leased the plant of the Central Electric Company, of La Crosse, for a term of 18 years.

MR. C. J. HAYES has resigned the management of the Peoples Gas Company, of Shenandoah, Ia., in order to take charge of the affairs of the Palatka (Fla.) gas works. To tell a part of the truth, it is high time that some one who knew had a chance to reform the latter.

A BELATED line or two from East Saginaw, Mich., dated the 17th inst., but which, owing to the dilatoriness of the railroad's service, did not reach us until the afternoon of the 19th, reads like this: "East Saginaw Club, Feb. 17, 1904: Dear JOURNAL: Colder than anyone ever knew; but we had a good meeting. Fully 100 present, and 55 new members were inscribed. President Cobb's address was all to the point. The decision to change the meeting time to September shows that reason will not be denied. The move to make the change should be credited to a man who says little but does much. The beefsteak dinner given by the good Cobb, at the East Saginaw Club, was simply great. The arrangements were complete, and—listen you, gas men—special attention was given to the lighting (illuminating, if you will) of the banquet hall. The Michigan Association is all right.—W. D."

AT the annual meeting of the shareholders of the Chattanooga (Tenn.) Gas Company the selling rate was ordered put at $1.10 per 1,000 cubic feet, gross, prompt payment to entitle the user to a rebate of 10 cents per 1,000. The officers elected were: President, J. A. Caldwell; Secretary and Treasurer, I. S. Post; Superintendent, James Forbes.

A GENTLEMAN well known to the gas fraternity, who has just returned from a protracted trip through the Southwest and South, while stopping in the JOURNAL office for a few minutes the other day, said: "It is nothing short of wonderful to note the advances made in the gas supply of New Orleans since the works there came under the domination of Mr. Shelton and the direction of Mr. Miller."

THE new storage holder (up to retaining 4,000,000 cubic feet) for the Providence (R. I.) Gas Company, is to be constructed by Messrs. Bartlett, Hayward & Co., of Baltimore.

IRELAND seems to be "doing a bit" in the gas business, for from the last Parliamentary returns reporting such trading there it seems that the Emerald Isle maintains 109 gas works, of which 86 are worked by companies and private owners, and 26 by local authorities. The prices charged to consumers vary considerably, the highest being Monaghan, 4s. 11½d. to 5s. 10d. and the lowest Belfast, 2s. 3d. Wexford comes next to Belfast with a charge of 2s. 7d. to 2s. 10d. These figures must, of course, be considered in connection with the illuminating power of the gas supplied, and in this respect Monaghan's 19-candle power compares very favorably with Belfast's 17, and Wexford's 14. The candle power in Dublin is given as 16, and the price so low as 3s. 2d., which will be news, indeed, to the majority of those who use gas in Dublin. The total annual consumption in Dublin is less by nearly 150,000,000 cubic feet than the total annual consumption in Belfast. The greatest illuminating power, 21-candle power, is produced in Bangor, county Down, at a cost to the consumer of 3s. 9d.

THE new plant of the San Antonio (Tex.) Gas and Electric Company is to be located on West Houston street, close to the tracks of the I. and G. N. Railroad, a spot which will serve the Company without being in any sense offensive to any of the well meaning residents of "San Antone."

THE Public Service Corporation, of New Jersey, has decreed that all of those employed in its "mechanical" departments shall wear a uniform. Some of the "mechanics" affected receive as much as $1.25 per day, and it does seem hard that they should have to pay for the aforesaid habiliment.

THE Fairmont Coal Company has again been awarded the contract for the supply of gas coal for the coming year that will be required by the municipal gas works of Wheeling, West Va.

ON April 18th the shareholders of the Laclede Gas Light Company, of St. Louis, Mo., will vote upon a proposition to increase the capital stock (common) of the Company from $8,500,000 to $17,000,000. It is also proposed to increase the bonded indebtedness from $10,000,000 to $20,000,000. It is to be presumed that in time the North American Company will engage in the water works business.

EXTENSIVE improvements are planned for this season in the plant at Champaign, Ills.

THE South Shore Gas and Electric Company has secured the properties and franchises of the Hammond (Ind.) Illuminating Company. The succeeding company also supplies gas to East Chicago, Ills., and to Indiana Harbor. Mr. C. G. Dawes is the moving spirit in the enterprise.

WORK has been commenced on the construction of the gas plant for Vancouver, B. C.

THE Rock Island (Ills.) Company has arranged for the placing of 4 additional miles of mains this season.

A RECENT issue of the New Haven (Conn.) *Register*, commenting on the public street lighting service of that city for the past year, contained this:

"According to the reports of the Department of Lamps, made by Chairman George H. Jacobs of the Committee on Public Lighting, and Lamp Inspector Henry Hopkins, which have been tendered to the Mayor, the department will have a deficit of at least $700 in its gas account under the appropriations which have been granted by the Board of Aldermen for 1904. The report calls attention to the reduction in the cost of gas and naphtha lighting under the new contracts and states that the efficiency of the department has been greater this year than last, as indicated by the fact that there were 743 less complaints received during the year just closed than for 1902. The report of Inspector Hopkins contains many interesting tables. Chairman Jacobs in his report says:

"'Your Committee herewith forwards its annual report for the year 1903. The appropriation for the year was $87,492.75, and the amount expended was $87,014.26, leaving a balance unexpended of $478.49. Twenty-nine meetings have been held, and 25 petitions were acted on. There have been 13 Welsbach gas lamps erected, 21 discontinued, and 13 reset. No new police signal lamps have been set up. Twelve naphtha Welsbach lamps have been erected, two discontined, 104 changed to gas, and 3 reset. Electric arc lamps erected, 14, and 13 changes were made of various kinds. The total number of lamps in use December 31, 1903, follows: Police, signal, 37; Welsbach gas, 1,102; Welsbach naphtha, 233; electric arc, 554; total 1,926. Net gain of 16. Number of street signs put in gas lamps, 177; in naphtha lamps, 95; iron street signs put up, 119. Total 391. Total number of complaints, 4,666; amount from outage deducted from bills, $159.05. The department has not had any receipts from sale of old stock or damage during the year. New contracts have been made for gas and naphtha lamps at greatly reduced figures. The appropriation as granted for 1904 on present number of gas lamps burning is about $700 short of running expenses. It will be impossible for the department to reduce expenses to the full amount needed.'

"Lamp Inspector Hopkins' report follows that of Chairman Jacobs. In it he pays a compliment to the police department for its aid during the year in keeping the service up to a high state of efficiency. In the course of his report Mr. Hopkins says: Outage deducted from lighting bills as follows: Police lamps, $1.09; Welsbach gas, $58.16; Welsbach gas temporarily discontinued, $47.93; naphtha Welsbach, $36.34; electric arc, $15.53; total, $159.05. There have been 30 dead posts taken up during the year. Total number of complaints received were as follows: Street signs in lamps, 7; police signal lamps, 71; Welsbach gas lamps, 3,127; naphtha Welsbach, 1,170; electric arc, 296; total, 4,666. Decrease from last year, 743. There remain unexecuted two orders for changing location of lamps. Gas lamp on East street near Chapel street is still on temporary discontinued list. Rather than tear up the asphalt pavement on West Chapel street a naphtha top has been placed on lamp corner Chapel street and Boulevard. The lamp is still on gas list for the present. Some plan should be devised for funds to trim trees near public lamps; also for street signs for the entire city, as well as for repair of walks where posts are taken up. These requests have been presented annually for several years. Our citizens are continually complaining about these items. The call for arc lamps is greatly in excess of our resources to grant.'"

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

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ELBERT P. CALLENDER,
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NOTIFICATION RESPECTING ADVERTISING.
Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:
New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, FEBRUARY 22, 1904.

The Market for Gas Securities.

Despite the efforts of the reformers and "others" to make it appear that in Albany this session something will be done to interfere with the progress of the legitimate gas interests of New York city, investors seem disposed to pick up Consolidated at anything in proximity to the price of $190 per share. In the face of a generally weak share market Consolidated closed to-day (Friday) at 189 to 190, which quotation is ex the regular dividend of 2 per cent. There is a more than even chance that the Astoria connecting pipe line bill will become a law.

Brooklyn Union is dull and unchanged. The Company is planning for great improvements on its main system, and its business grows better every day, notwithstanding the many and fervent kicks that are being made by the "reformers." The proprietors of the Laclede Gas Company, of St. Louis, are preparing for "a substantial increase" in the common stock and bonds. Particulars respecting the proposed increase will be found in our current item columns. Peoples, of Chicago, is 97⅜ bid, and Washington (D. C.) is 277½ to 282½.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

FEBRUARY 29.

☞All communications will receive particular attention.

☞The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$78,177,000	100	189	190
Central Union, Bonds, 5's	3,000,000	1,000	104	106
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	118	120
Metropolitan	655,000	..	108	112
Mutual	3,500,000	100	280	290
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co..				
Bonds, 5's	11,000,000	1,000	103	105
Northern Union, Bonds, 5's.	1,250,000	1,000	105	106⅛
New York and East River..				
Bonds 1st 5's	3,500,000	1,000	102	106
" 1st Con. 5's	1,500,000	..	109	111
Standard	5,000,000	100	125	135
Preferred	5,000,000	100	145	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	116	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	180	190
" " Bonds (5's)	15 000,000	1,000	113	115
Bay State	50,000,000	50	3/16	¼
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	509,000	1,000	93	96
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47⅛	50
Buffalo City Gas Co.	5,500,000	100	4⅜	4½
" " Bonds, 5's	5,250,000	1,000	65	69
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas and Electric Co.	29,500,000	100	97¾	98
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	101	101½
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	88¾	89⅛
Preferred	3,026,500	100	107⅛	109
Consumers, Jersey City Bonds	600,000	1,000	100	102
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	—	—
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	86	90
Consolidated G. & E. Co.'s. Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	..	50
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	361,000	1,000	75	75¼
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	245	265
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	55	65
" Bonds, 6's	2,650,000	..	103½	106½
Jackson Gas Co	250,000	50	73	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	79	90
Preferred	2,500,000	100	90	100
Bonds	10,000,000	1,000	109½	110
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	136	140
Madison Gas & Elec. Co.				
" 1st Mtg. 6's	350,000	1,000	107½	108½
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	184¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	4,600,000	..	105	105¾
New Haven	1,000,000	25	64	70
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	97⅜	97¾
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	.
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	15,800,000	100	..	55
St. Joseph Gas Co.				
" 1st Mtg. 5's	751,000	1,000	92	96½
St. Paul Gas Light Co	1,500,000	100	4	4
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112½	115
General Mortgage, 5's	2,465,000	1,000	92	93
Syracuse, N. Y.	1,975,000	100	46	48
Bonds	2,047.000	1,000	94	96
Washington, D. C	2,600,000	20	277½	282½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	.	..	..
Wilmington, Del	600,000	50	230	..

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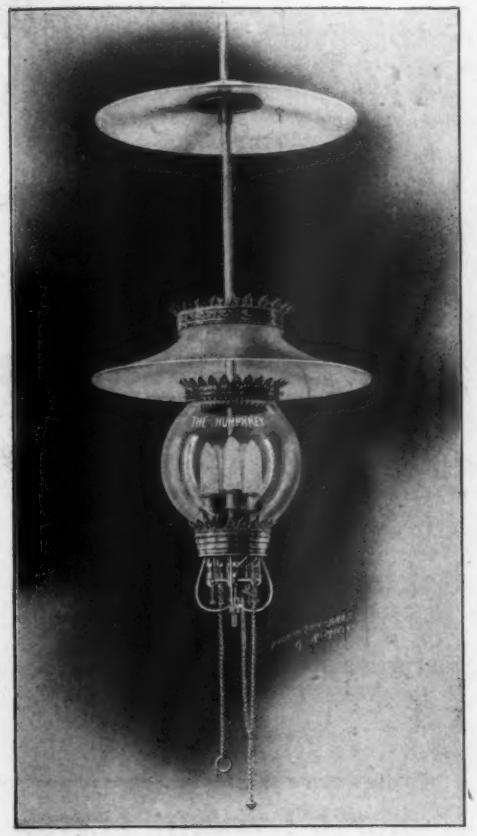

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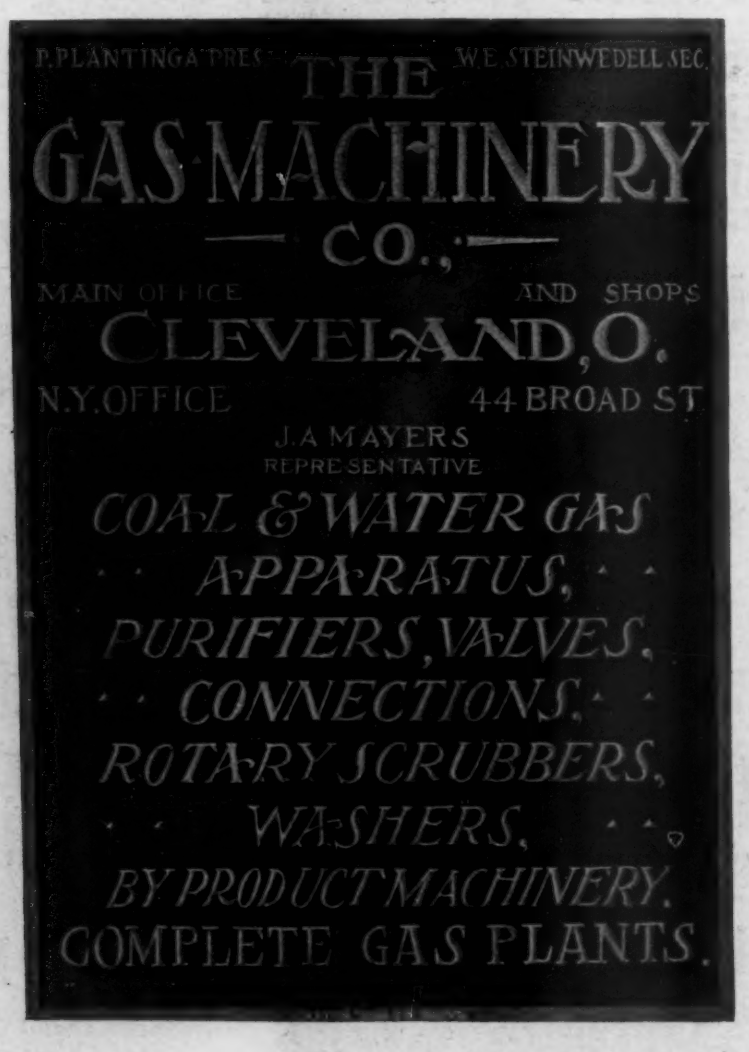

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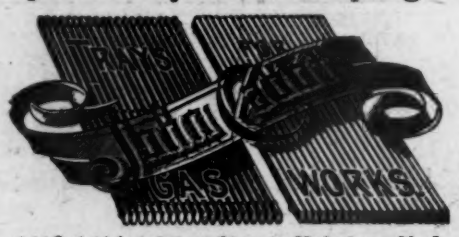

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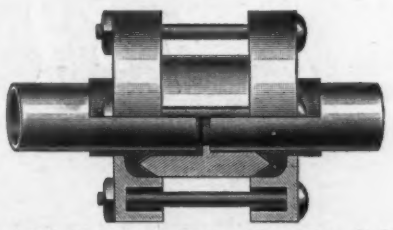

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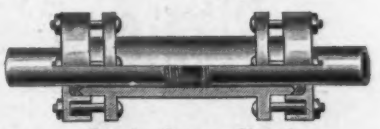

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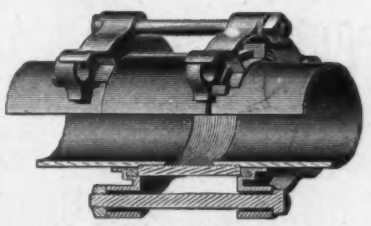
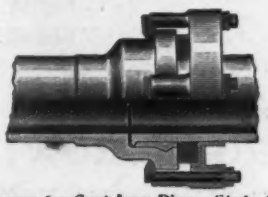


Clamp. Style 4.



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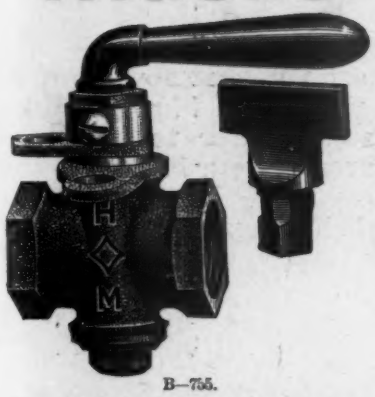

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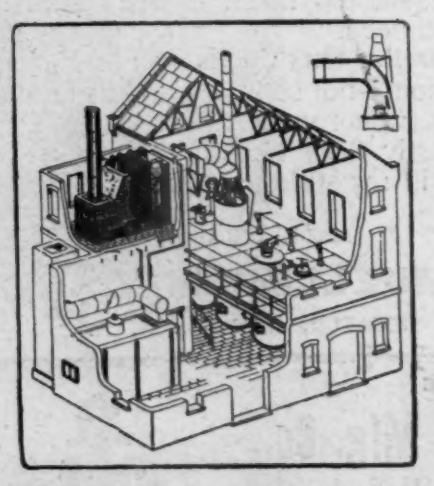

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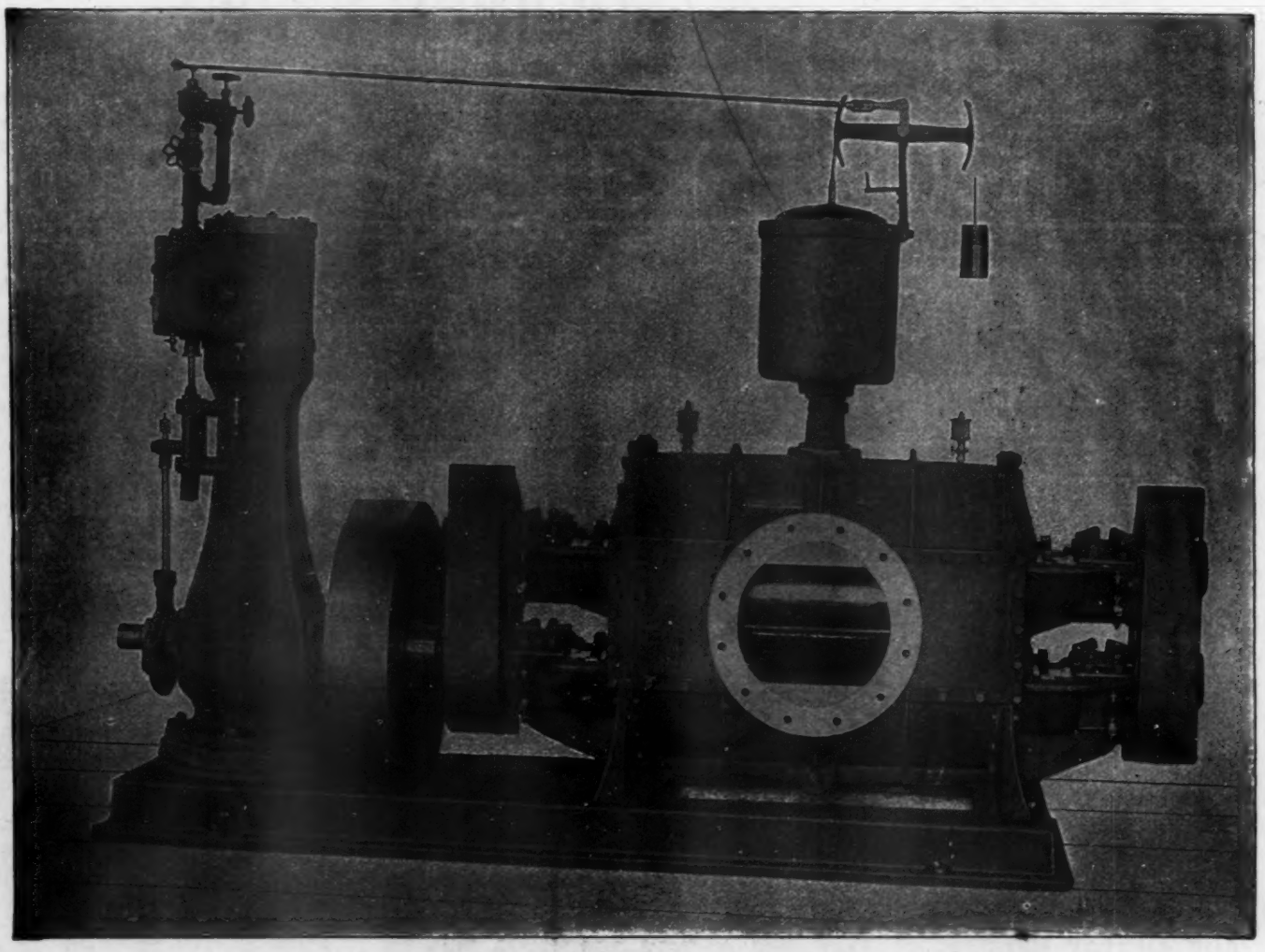

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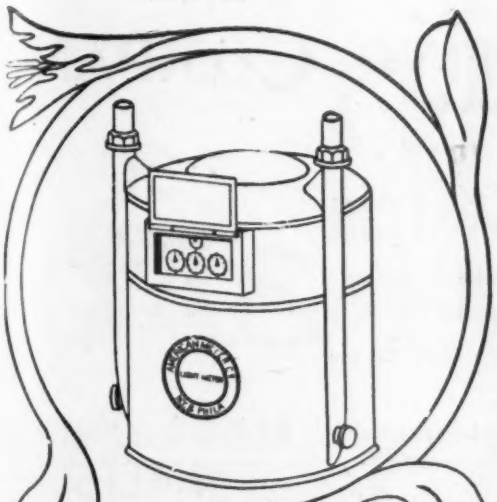
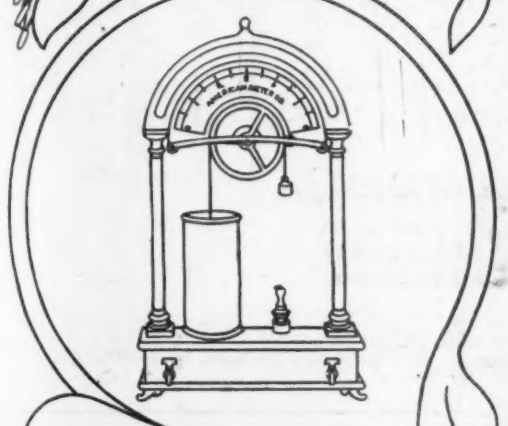
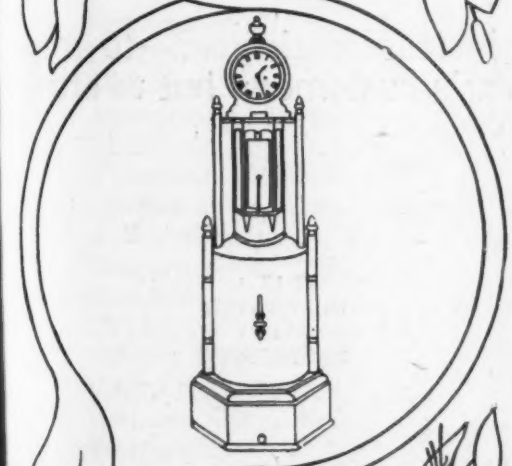


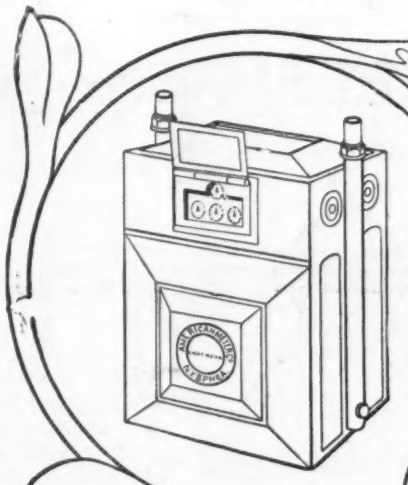


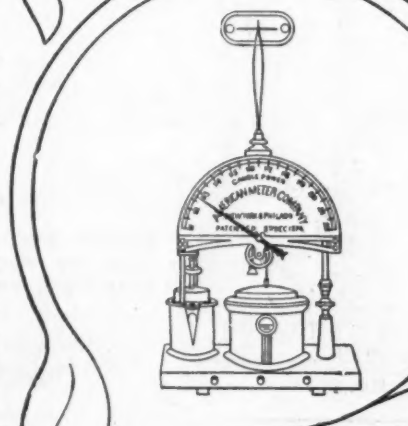


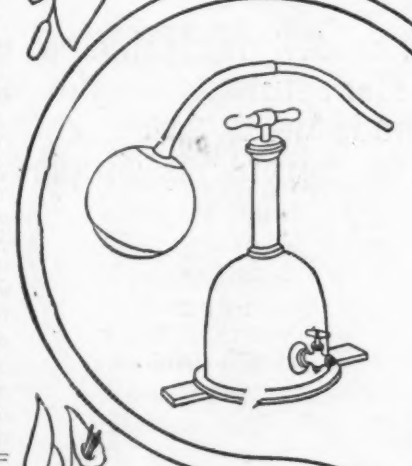
PUBLIC LIGHTING TABLE.

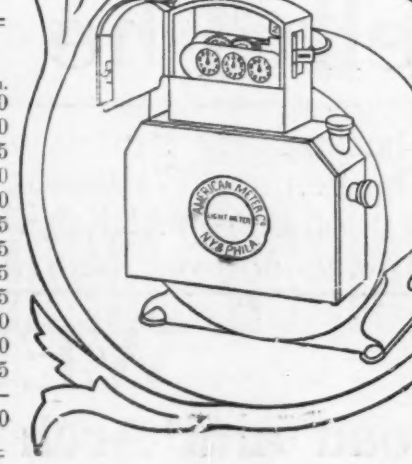
MARCH, 1904.

Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Tue.	1	No L. FM	No L.	5.30	5.45
Wed.	2	No L.	No L.	5.30	5.45
Thu.	3	6.20 PM	9.00 PM	5.30	5.45
Fri.	4	6.20	10.10	5.30	5.45
Sat.	5	6.20	11.20	5.40	5.35
Sun.	6	6.30	12.20 AM	5.40	5.35
Mon.	7	6.30	1.20	5.40	5.35
Tue.	8	6.30 LQ	2.20	5.40	5.35
Wed.	9	6.30	3.10	5.40	5.35
Thu.	10	6.30	3.50	5.40	5.35
Fri.	11	6.30	4.30	5.40	5.35
Sat.	12	6.30	5.10	5.50	5.20
Sun.	13	6.40	5.10	5.50	5 20
Mon.	14	6.40	5.10	5.50	5.20
Tue.	15	6.40	5.10	5.50	5.20
Wed.	16	6.40 NM	5.10	5.50	5.20
Thu.	17	6.40	5.10	5.50	5.20
Fri.	18	6.40	5.10	5.50	5.20
Sat.	19	6.40	5.10	6.00	5.10
Sun	20	6.40	5.00	6.00	5.10
Mon.	21	9.40	5.00	6.00	5.10
Tue.	22	10.40	5.00	6.00	5.10
Wed.	23	11.40	5.00	6.00	5.10
Thu.	24	12.30 AM FQ	5.00	6.00	5.10
Fri.	25	1.20	5.00	6.00	5.10
Sat.	26	2.10	5.00	6.10	4.55
Sun.	27	2.50	4.50	6.10	4.55
Mon.	28	3.40	4.50	6.10	4.55
Tue.	29	No L.	No L.	6.10	4.55
Wed.	30	No L. FM	No L.	6.10	4.55
Thu.	31	No L.	No L.	6.10	4.55









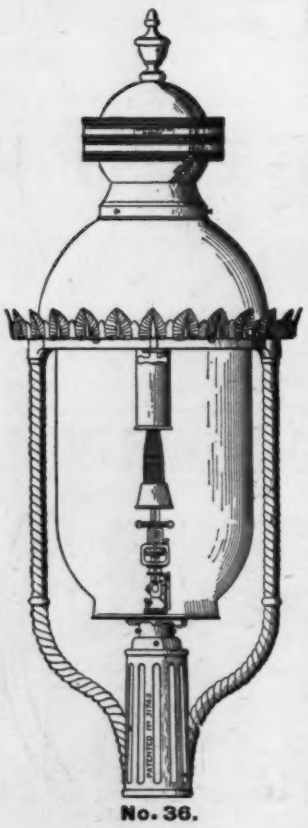
TOTAL HOURS LIGHTING DURING 1904.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	225.00	January	423.20
February	205.40	February	367.40
March	187.40	March	355.35
April	169.50	April	298.50
May	152.30	May	264.50
June	137.20	June	234.25
July	138.50	July	243.45
August	151.00	August	280.25
September	164.40	September	321.15
October	191.30	October	374.30
November	210.30	November	401.40
December	237.10	December	433.45
Total, yr.	2171.40	Total, yr.	4000.00

NEW YORK, 33 Nassau Street. BOSTON. 814 Beacon Building. PHILADELPHIA, Bread and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, Foot of Orleans Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



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POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 38.

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The formula is simple-

THIS SHIELD IS THE WELSBACH TRADE MARK.

IT IS A GUARANTEE AND A PROTECTION.

Sell The Welsbach Brands.

The imitation stuff is bad for the customer---which is bad for you.

The genuine Welsbachs---Burners or Mantles---make satisfied customers---keep customers---MAKE NEW ONES.

And your profit isn't merely dollars and cents.

WELSBACH CO.,

Broad and Arch Sts., PHILADELPHIA.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31, 1903, has been Awarded Contracts in the Following Places for

Standard Double-Superheater Lowe Water Gas Apparatus.

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Baltimore, Md.	Lynn, Mass.	New York (Central Union Co.)
Chicago, Ills.	Newark, N. J.	Cicero, Ills.
Amesbury, Mass.	Washington, D. C.	Chicago (Ogden Co.)
Aberdeen, S. D.	Boone, Ia.	Easton, Pa.
Winsted, Conn.	Pueblo, Col.	Lawrence, Mass.
Canon City, Col.	Charlotte, N. C.	Council Bluffs, Ia.
Schenectady, N. Y.	Fall River, Mass.	Chattanooga, Tenn.
Hagerstown, Md.	Duluth, Minn.	Tuckerton, N. J.
Malden, Mass.	New York (Mutual Co.)	Springfield, O.
Bridgeport, Conn.	Waltham, Mass.	Easton, Pa. (2d contract).
Albert Lea, Minn.	Dover, Del.	Mobile, Ala.
Brooklyn, N. Y.	York, Pa.	Conshohocken, Pa.
Kansas City, Kas.	Minneapolis, Minn.	Mason City, Ia.
Hempstead, N. Y.	Allentown, Pa.	

TOTAL SETS FOR 1903, ... 62
TOTAL DAILY CAPACITY, ... 62,950,000 cubic feet.
TOTAL SETS TO DATE, ... 508
TOTAL DAILY CAPACITY, ... 362,780,000 cubic feet.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
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ADAM WEBER SONS,
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As far as we can see at the present time, it will only be necessary for us to put in new retorts in resetting these benches, as the furnace blocks and recuperative flues are in very good condition.

Yours very truly,
(Signed) W. B. TUTTLE,
General Manager.

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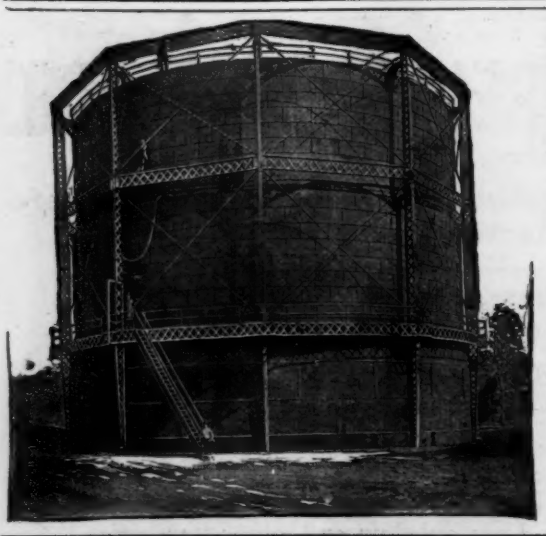

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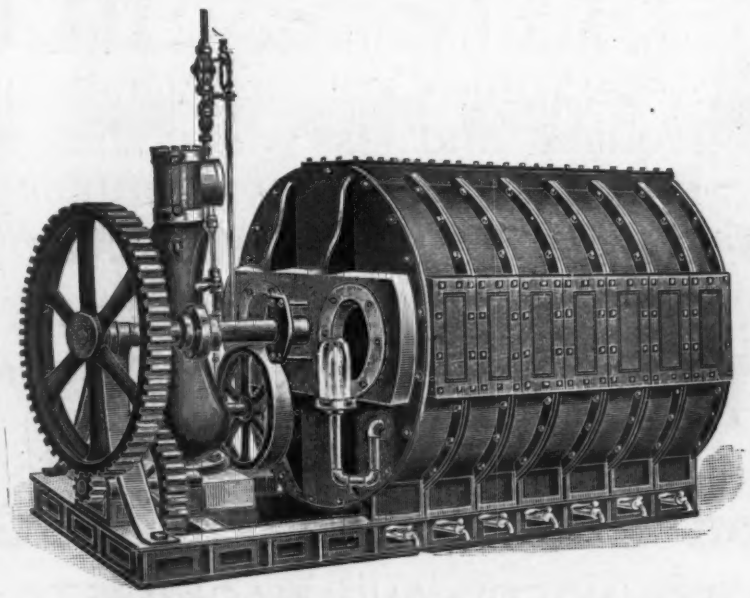

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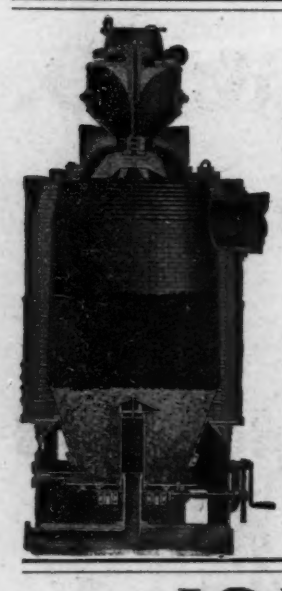

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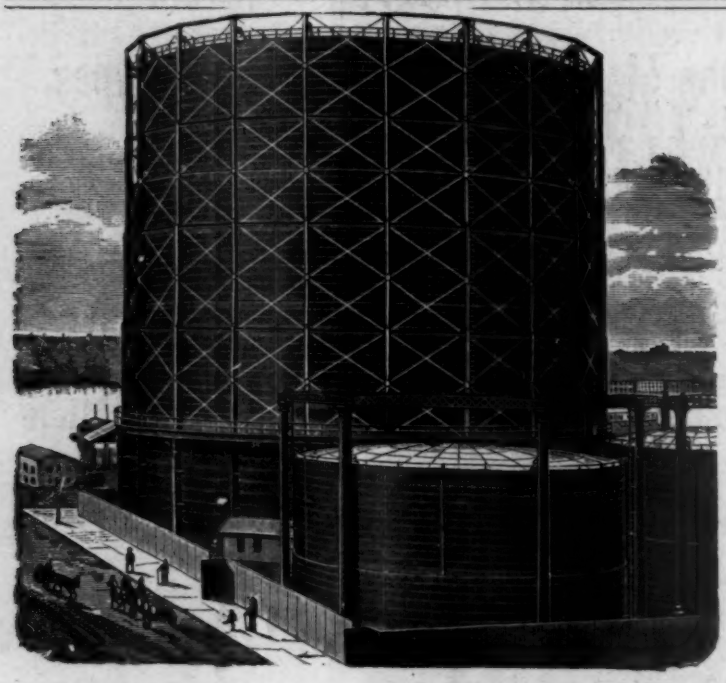

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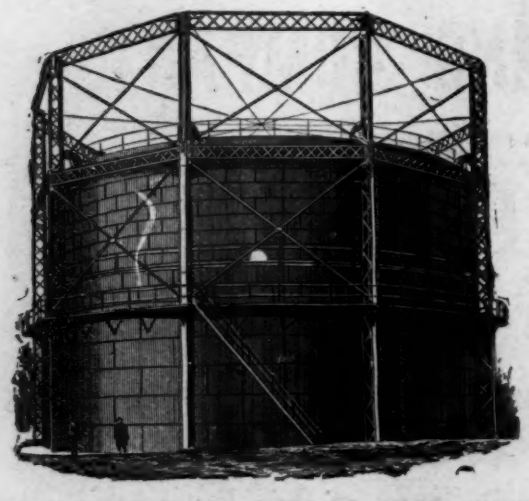

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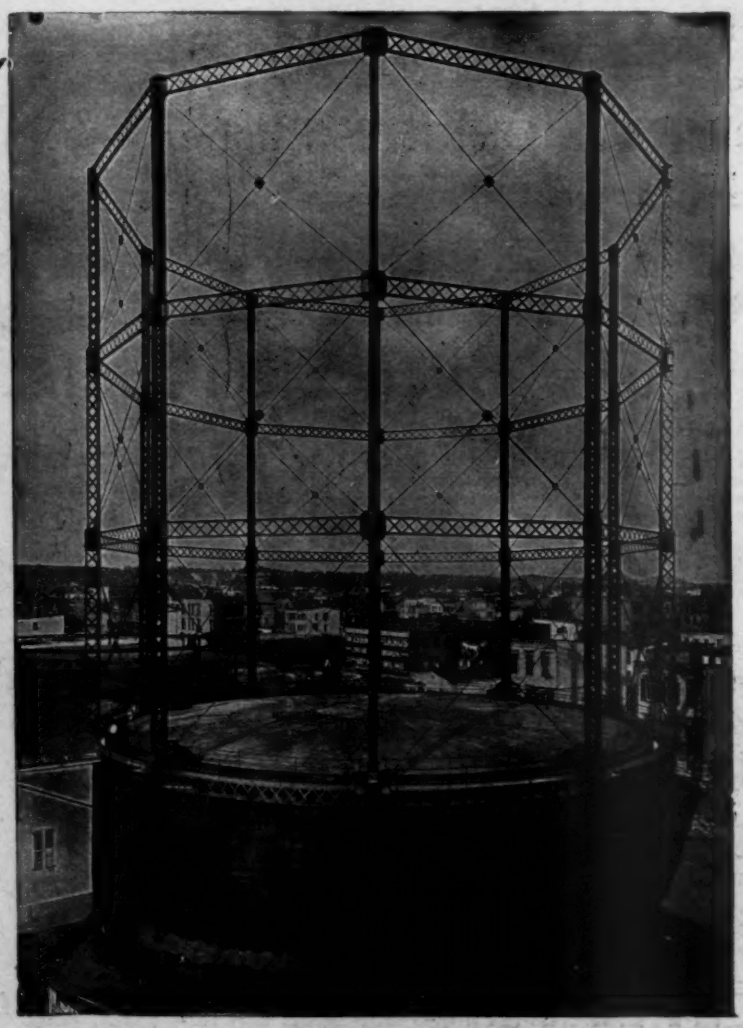

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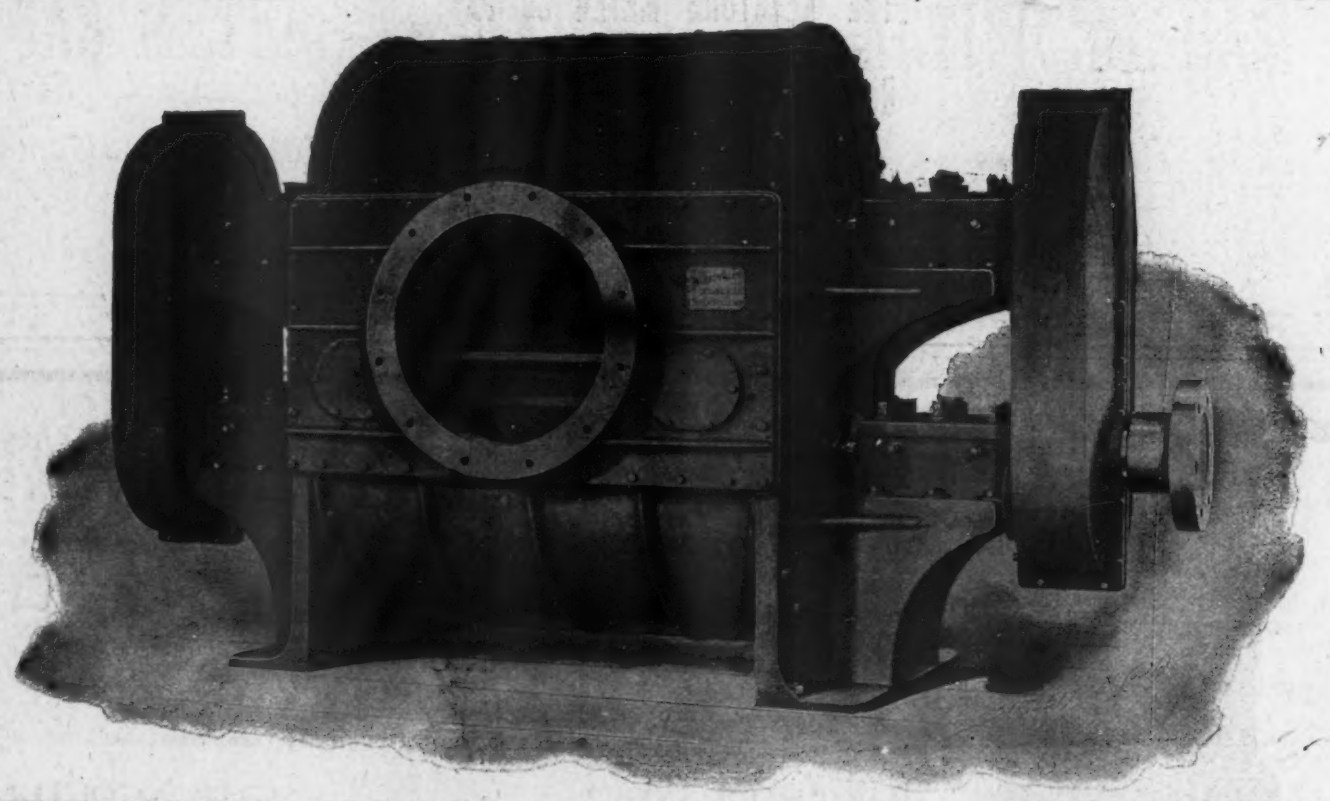

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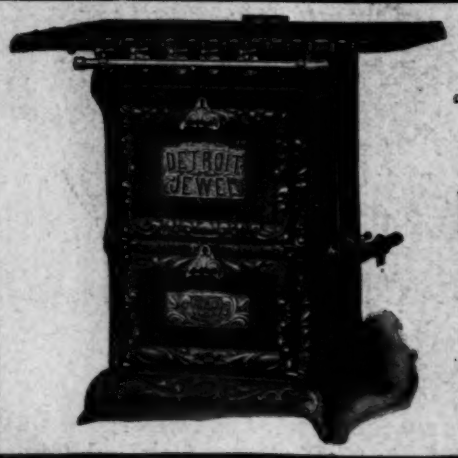

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